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31 March 2010

Mr. Jonathan S. Davis  
Remediation Program Manager  
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322 E. Inner Road  
Otis ANG Base, MA 02542-5028

SUBJECT: AFCEE 4P08 FA8903-08-D-8769; Task Order 0148  
MMR SPEIM/LTM/O&M Program  
CDRL #A0011  
**Fuel Spill-12 2009 Summary Letter Report**

Dear Mr. Davis:

The purpose of this Summary Letter Report (SLR) is to document the results of sampling activities conducted at the Fuel Spill-12 (FS-12) plume under the System Performance and Ecological Impact Monitoring (SPEIM) program during the 2009 calendar year. This deliverable contains no detailed assessment or evaluation of the results, but is a means of documenting all the actions completed under the FS-12 SPEIM program. The data collected under the SPEIM program are continually assessed and the results of these assessments are presented initially during the Technical Update Meetings and then through Technical Memoranda or Project Note deliverables, if warranted, based on the results of the data evaluation or to address particular plume issues.

This letter report includes a summary of the activities performed and the data collected for the FS-12 SPEIM program between 01 January 2009 and 31 December 2009. The contaminants of concern (COCs) for the FS-12 plume are ethylene dibromide (EDB) and benzene. Benzene has not been detected at a concentration above the Maximum Contaminant Level (MCL) of 5 micrograms per liter ( $\mu\text{g/L}$ ) at any monitoring wells located downgradient of the source area since 2006 or within the source area since 2007. Therefore, the FS-12 plume is defined by groundwater containing EDB at concentrations above the Massachusetts Maximum Contaminant Level (MMCL) of  $0.02 \mu\text{g/L}$ . The FS-12 extraction, treatment, and reinjection (ETR) system began operation in 1997 with a design flow rate of 772 gallons per minute (gpm) from a total of 25 operating extraction wells. The treated water was then returned to the aquifer through 22 reinjection wells. Since 1997 the FS-12 ETR system has been optimized several times and is currently operating under pumping conditions specified by 2008 Scenario 01, which has a total flow rate of 360 gpm from four operating extraction wells. The extracted groundwater is conveyed to the FS-12 treatment plant where it is treated by a granular activated carbon system, combined with the J-3 range groundwater treatment system effluent ( $\sim 195$  gpm), and returned to the aquifer via 20 of the 22 FS-12 reinjection wells. The J-3 range

groundwater treatment system is a separate treatment train that is located within the FS-12 treatment facility and is owned and operated by the Impact Area Groundwater Study Program. The FS-12 plume and treatment system are presented on [Figure 1](#).

The Air Force Center for Engineering and the Environment (AFCEE) installed and operated the FS-12 ETR system as an interim response action, which, along with land use controls became the selected remedy as documented in the Final Record of Decision (AFCEE 2006).

## **FS-12 SPEIM ACTIVITIES**

The SPEIM program was developed to monitor plume changes and to ensure the effective operation of the AFCEE groundwater remediation systems at the Massachusetts Military Reservation (MMR). These objectives are met through monitoring of selected media (i.e., groundwater, surface water) within and outside the plume boundaries, treatment plant monitoring, and groundwater flow and transport modeling. Activities completed for the FS-12 SPEIM program during 2009 include the following:

### **SPEIM Sampling Activities:**

- Annual and semiannual groundwater sampling (May 2009 and December 2009)
- Monthly treatment plant sampling (January 2009 through December 2009)
- Semiannual extraction well sampling (May 2009 and December 2009)
- Seasonal (May 2009 and July 2009) recreational beach area surface water sampling at Snake Pond
- Recording of daily average treatment system flow rates (January 2009 through December 2009)
- Semiannual sampling of FS-12 treatment plant influent for perchlorate and explosives by the Impact Area Groundwater Study Program
- No hydraulic monitoring was needed at FS-12 during 2009

The groundwater and surface water locations sampled for the FS-12 SPEIM program in 2009 are presented in [Figure 2](#). Well construction and surface water sample location information is included in [Table 1](#). The current approved FS-12 SPEIM network is presented in the *Comprehensive Long Term Monitoring Plan*, which is available on-line at [www.mmr.org](http://www.mmr.org) under Plans and Protocols.

Groundwater and surface water analytical results are presented in [Table 2](#). A map showing the distribution of COC detections in groundwater is included as [Figure 3](#). A comparison of all compounds detected in groundwater and treatment plant samples to applicable standards is included in [Attachment A](#).

### **Drilling and Direct-Push Activities:**

- One sonic soil boring (90BH0100) was advanced within the footprint of the FS-12 plume in October 2009 ([Figure 2](#)). This boring was advanced to collect continuous soil core from the water table to bedrock for field lithologic classification. No groundwater vertical profiling for EDB was completed at this location and no monitoring wells were installed (this boring was advanced adjacent to existing monitoring well cluster 90MW0106A,B,C, and D). The boring log for 90BH0001 is included in [Attachment B](#). In addition, splits of discrete soil samples were collected from this boring to support an EDB degradation study being conducted for AFCEE by the University of Massachusetts (UMass). The goal of the UMass study is to provide kinetic data on the degradation of EDB under natural conditions at MMR that can be incorporated into the existing groundwater models used to predict EDB fate and transport at MMR. The soil samples collected from 90BH0001 were used by UMass to construct EDB microcosms under varying conditions to measure the rate of natural attenuation of EDB in FS-12 aquifer materials and to understand the effect of aeration, EDB concentrations and addition of electron donors and nutrients on EDB biodegradation. Data from the UMass study may be incorporated into the groundwater fate and transport models used at MMR and may also be used to identify methods for enhanced natural attenuation of EDB in the aquifer.

### **Data Summary Report:**

The data summary reports for the analytical data reported in this SLR are included in [Attachment C](#). [Attachment C](#) also includes a Corrective Action Report associated with the reporting of EDB data collected between June and August 2009. It was determined that the analytical laboratory was not reporting EDB detections at estimated concentrations below the reporting limit for some of the samples. The affected EDB results were corrected and re-reported by the laboratory. This EDB reporting issue had no impact on the decision making process under the SPEIM/Operations and Maintenance Program at FS-12. A summary of the affected data and project impacts is provided in Table 1 of the Corrective Action Report.

### **Presentations:**

Presentations for the FS-12 plume are listed in [Table 3](#).

### **Project Note Submittals:**

The project note related to activities conducted for the FS-12 plume under the SPEIM program in 2009 is included in [Attachment D](#).

### **Report Submittals:**

- *Fuel Spill-12 2008 Summary Letter Report* (March 2009)

### **Major Events and Optimizations:**

Collection of soil samples for the UMass EDB microcosm study was completed at FS-12 in October 2009 (as described previously). Data from the UMass study will be incorporated into the existing FS-12 groundwater model used to predict EDB fate and transport. No changes to the ETR system or monitoring network were implemented in 2009.

### **FS-12 REMEDIAL STATUS UPDATE**

Analytical results for samples collected at the FS-12 treatment plant are presented in [Table 4](#). Average weekly flow rates for the FS-12 ETR system are presented in [Table 5](#). Treatment system operational downtimes or deviations (for events lasting two hours or longer) in 2009 are summarized in [Table 6](#). Mass removal calculations through December 2009 are presented in [Table 7](#).

A total of 134.8 pounds (lbs) of EDB have been removed by the FS-12 ETR system since startup in 1997. The most recent plume shell for the FS-12 EDB plume includes data collected through May 2004. The 2004 plume shell was estimated to contain approximately 220 million gallons of groundwater contaminated with EDB at concentrations above the MMCL; and approximately 3.55 lbs of dissolved-phase EDB at concentrations above the MMCL (AFCEE 2005). System performance monitoring data indicate that 0.7 lbs of EDB were removed, from the treatment of 182 million gallons of groundwater, by the plant in 2009 and a total of 9.5 lbs of EDB removed since June 2004. The apparent discrepancy between actual mass removed and mass estimated in the 2004 plume shell is attributed to the additional EDB mass identified within the core of the plume during the 2008 data gap investigation that was not represented in the 2004 plume shell. Data collected under the SPEIM program and the results of the 2008 data gap investigation (AFCEE 2008) indicate that the FS-12 plume is being captured by the ETR system.

The operation of the FS-12 remedial system used approximately 946 megawatt hours of electricity during 2009. Power plant air emissions associated with this power generation for 2009 and since system startup in September 1997 are presented in [Table 8](#). Green energy purchases and power production from the 1.5 megawatt wind turbine, which started operation on 02 December 2009, are incorporated into these air emissions data.

The FS-12 ETR system is currently operating under the 2008 Scenario 01 pumping configuration. The latest model transport simulations completed for the 2004 plume shell indicate EDB concentrations greater the MMCL remain in the aquifer and ETR system operation is required through the last simulation year of 2048 (AFCEE 2005). Through the SPEIM program, remedial system operation is continuously evaluated and optimized to reduce cleanup times, therefore the timeframes presented in the preceding section will most likely be decreased in future scenarios.

## **FS-12 SPEIM ACTIVITIES PLANNED FOR 2010**

Activities currently planned for the FS-12 SPEIM program for 2010 include the following:

- Field data gap investigation to include continuous soil coring for field classification and groundwater vertical profiling for EDB at up to three boring locations (spring 2010).
- Biennial (May 2010) and semiannual (December 2010) groundwater sampling.
- Update of EDB plume shell using data collected during the field data gap investigation and regular SPEIM monitoring (summer 2010).
- ETR optimization evaluation using data obtained during the field data gap investigation and findings of UMass EDB microcosm study.
- Optimization of the FS-12 SPEIM chemical monitoring network based on a review of field data gap and SPEIM monitoring data.
- Synoptic water level measurements (as needed).
- Monthly treatment plant sampling (January 2010 through December 2010).
- Recording of daily average treatment system flow rates (January 2010 through December 2010).
- Semiannual sampling of FS-12 treatment plant influent for perchlorate and explosives by the Impact Area Groundwater Study Program.
- FS-12 SPEIM data presentations (as needed).
- Seasonal (May and July 2010) recreational beach area surface water sampling.
- Land use control private well verification surveys and sampling (as needed).

If you have any questions or comments, please contact Rose Forbes at (508)-968-4670, extension 5613.

Sincerely,

CH2M HILL



Patricia de Groot P.G.  
Program Manager

Attachments:

<a href="#">Figure 1</a>	FS-12 Groundwater Plume and Treatment System
<a href="#">Figure 2</a>	FS-12 Chemical Monitoring Locations
<a href="#">Figure 3</a>	FS-12 2009 COC Detections in Groundwater
<a href="#">Table 1</a>	FS-12 Well Construction and Surface Water Sampling Location Information
<a href="#">Table 2</a>	FS-12 Groundwater and Surface Water Monitoring Results
<a href="#">Table 3</a>	FS-12 Meeting Presentations
<a href="#">Table 4</a>	FS-12 Treatment Plant Sampling Results
<a href="#">Table 5</a>	FS-12 Treatment System Flow Rates
<a href="#">Table 6</a>	FS-12 Treatment System Downtime Summary
<a href="#">Table 7</a>	FS-12 Treatment System Mass Removal Summary
<a href="#">Table 8</a>	FS-12 Remedial System Electrical Consumption and Associated Air Emissions
<a href="#">Attachment A</a>	Comparison of Detected Concentrations in FS-12 Groundwater and Treatment Plant Samples to Applicable Groundwater Standards
<a href="#">Attachment B</a>	Boring Log – 90BH0001
<a href="#">Attachment C</a>	FS-12 2009 SLR Data Summary Reports
<a href="#">Attachment D</a>	FS-12 Project Note

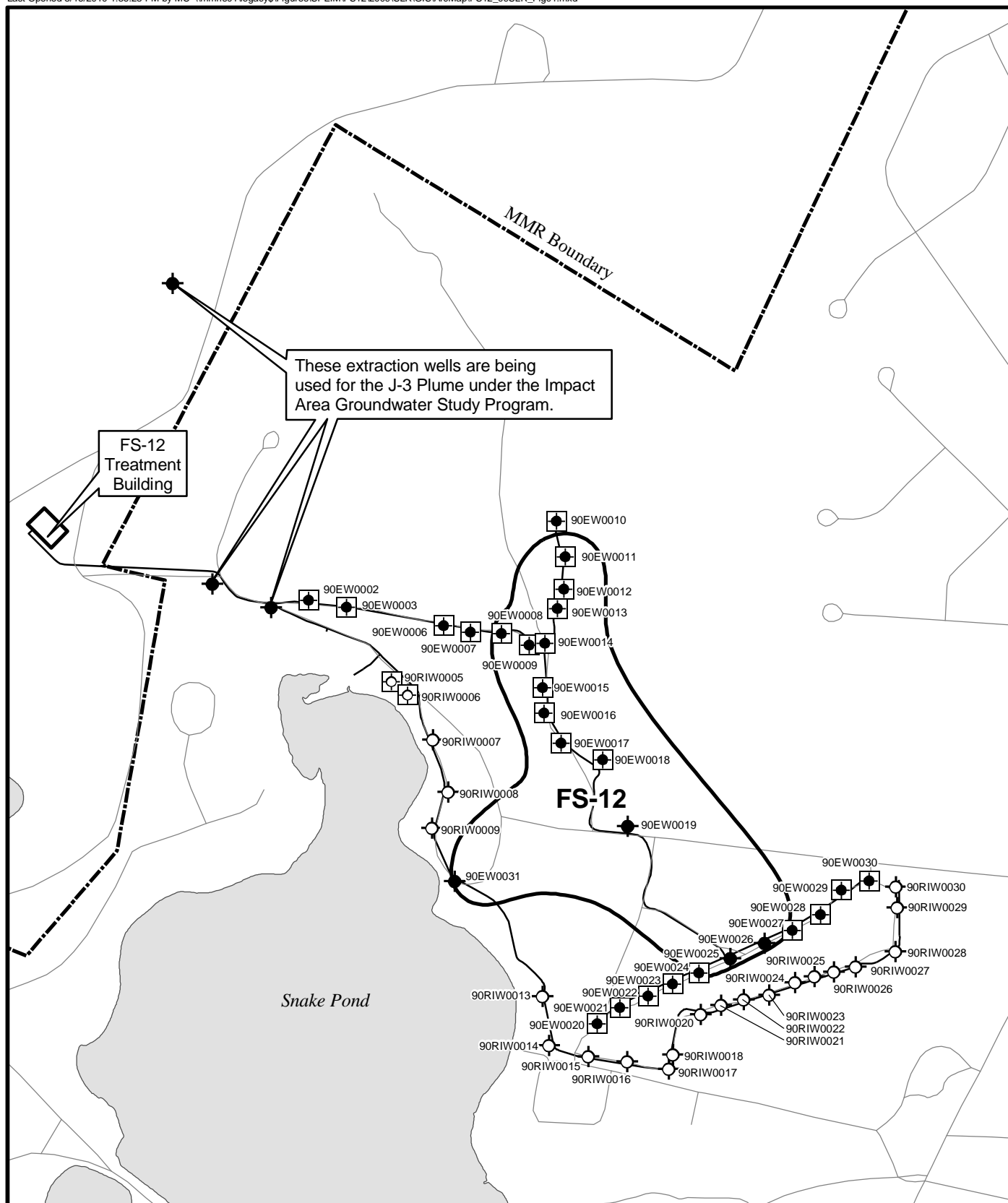
* c: Rose Forbes, AFCEE/MMR	Denis LeBlanc, USGS
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\* Delivery via email notifying recipients of availability of electronic document at [www.mmr.org](http://www.mmr.org).

**REFERENCES**

- AFCEE. 2008 (July). *Fuel-Spill 12 2008 Extraction, Treatment, and Reinjection System Optimization*. 371335-SPEIM-FS12-PRJNOT-001. Prepared by CH2MHILL for AFCEE/MMR, Installation Restoration Program, Otis Air National Guard Base, MA.
- AFCEE. 2006 (September). *Final Record of Decision for Fuel Spill-12 Groundwater*. A3P-J23-35Z04802-M26-0010. Prepared by Jacobs Engineering Group Inc. for AFCEE/MMR, Installation Restoration Program, Otis Air National Guard Base, MA.
- AFCEE. 2005 (July). *Final Fuel Spil-12 2005 Optimization Technical Memorandum*. 324146-SPEIM-FS12-TECHMEM-002. Prepared by CH2MHILL for AFCEE/MMR, Installation Restoration Program, Otis Air National Guard Base, MA.

## FIGURES

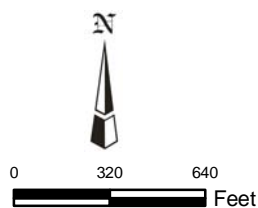


# Legend

- ◆ Extraction Well (On)
- ◼ Extraction Well (Off)
- ⊕ ReInjection Well (On)
- ◻ ReInjection Well (Off)

- Plume Boundary
- - - MMR Boundary
- Pipeline
- ◻ Treatment Plant

Data Source: AFCEE, March 2009, MMR-AFCEE Data Warehouse



NOTE: Well configuration represents 2008 Scenario 01 Pumping Configuration.

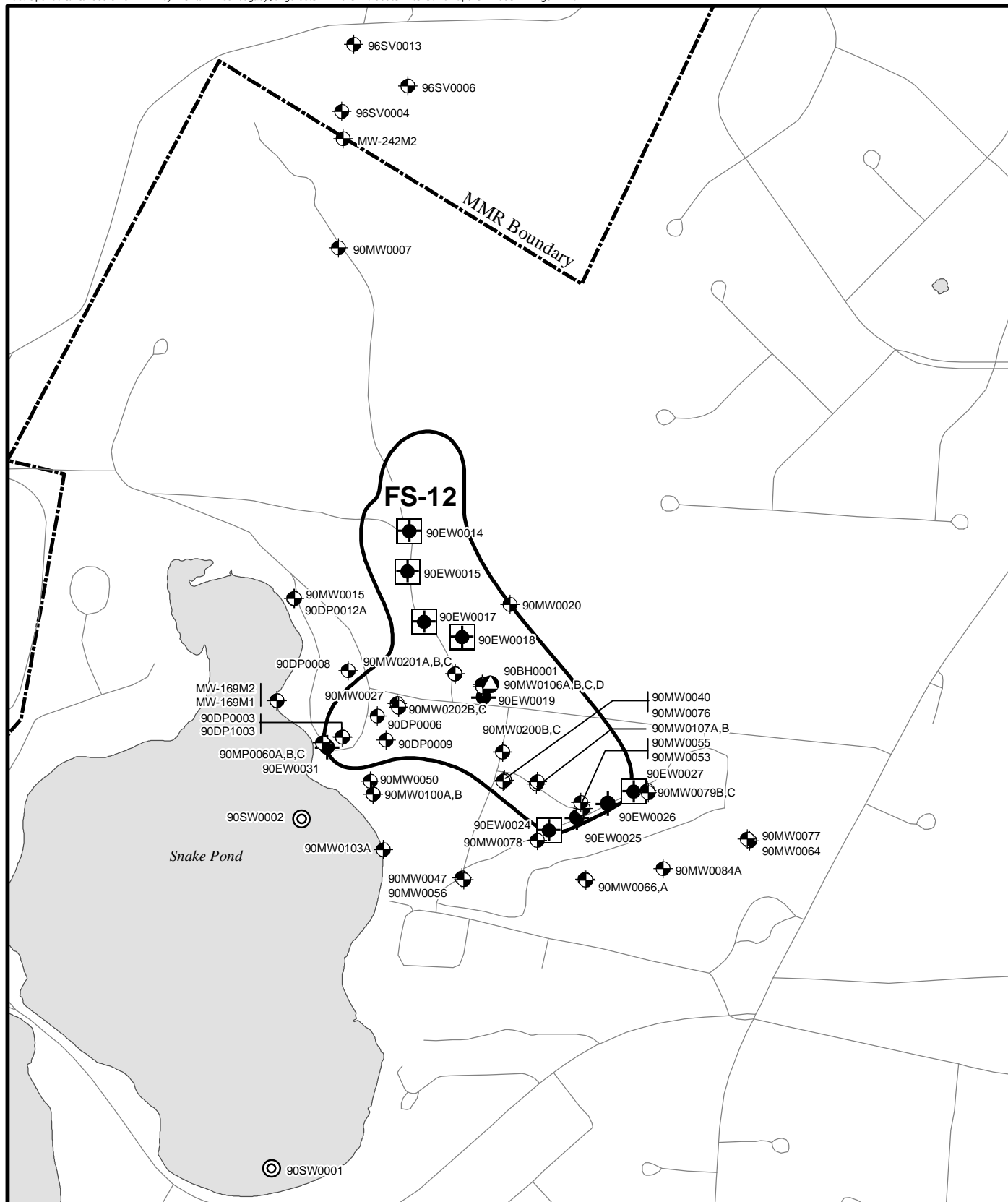
## FIGURE 1

### FS-12 GROUNDWATER PLUME AND TREATMENT SYSTEM

AFCEE - Massachusetts Military Reservation  
FS-12 2009 Summary Letter Report

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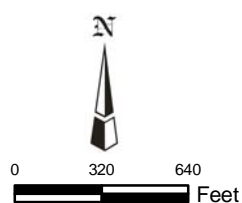


### Legend

Data Source: AFCEE, March 2010, MMR-AFCEE Data Warehouse

- ◆ Extraction Well (On)
- ◼ Extraction Well (Off)
- ⊕ Monitoring Well
- ▲ Sonic Borehole
- ⊙ Surface Water Sample Site

- Plume Boundary
- - - MMR Boundary

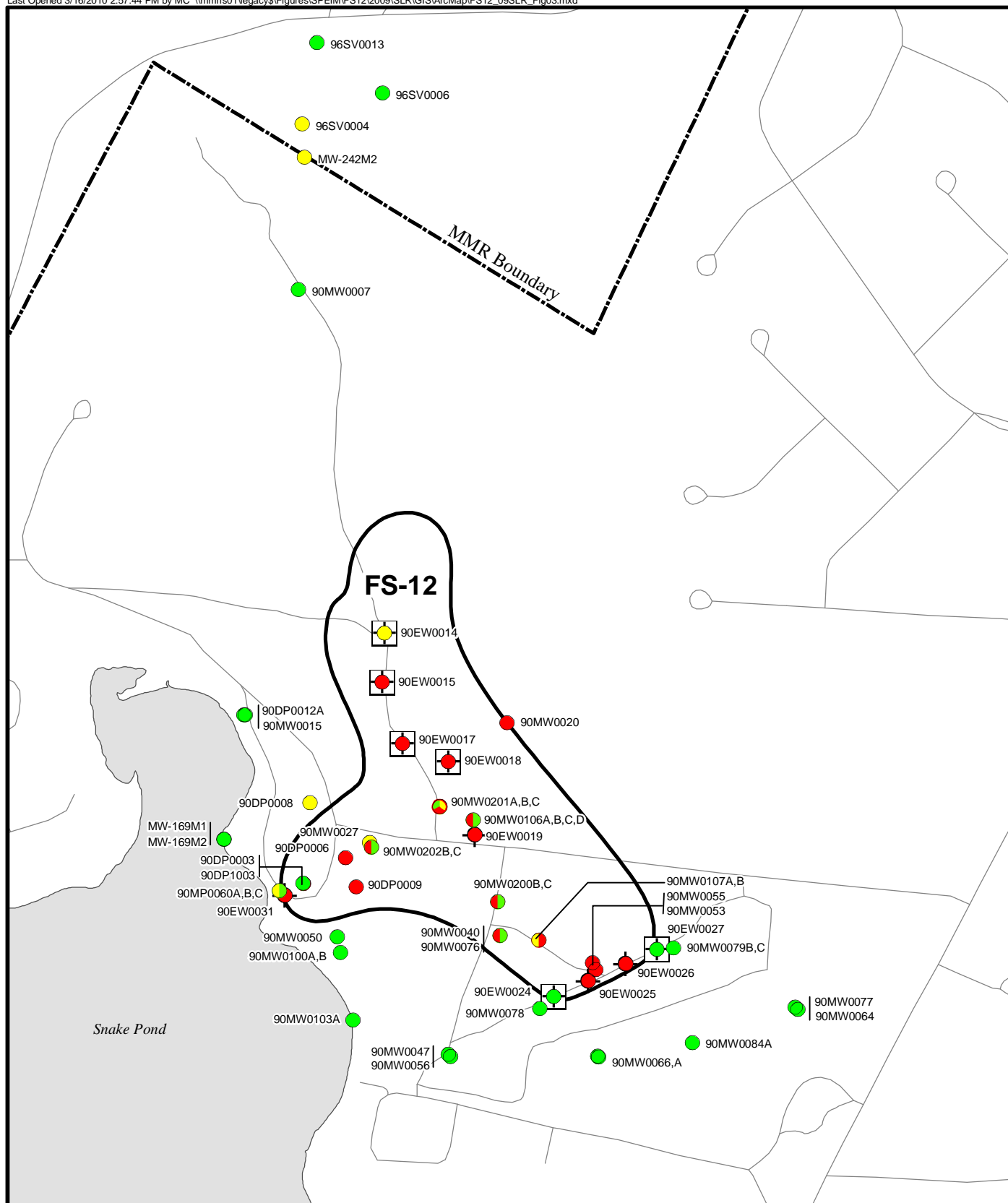


### FIGURE 2

#### FS-12 CHEMICAL MONITORING LOCATIONS

AFCEE - Massachusetts Military Reservation  
FS-12 2009 Summary Letter Report

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### Legend

- ◆ Extraction Well (On)
- ◼ Extraction Well (Off)
- Plume Boundary
- - - MMR Boundary

Data Source: AFCEE, March 2010, MMR-AFCEE Data Warehouse

### Contaminant Detections in Groundwater:

- No Detection
- Detection Below or at MMCL
- Detection Above MMCL



0 320 640 Feet

### FIGURE 3

### FS-12 2009 COC DETECTIONS IN GROUNDWATER

AFCEE - Massachusetts Military Reservation  
FS-12 2009 Summary Letter Report

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## **TABLES**

**Table 1**  
**FS-12 Well Construction and Surface Water Sampling Location Information**  
**FS-12 2009 Summary Letter Report**

Location	Northing Coordinate on Surface (ft)	Easting Coordinate on Surface (ft)	Surface Elevation (ft msl)	Measuring Point Elevation (ft msl)	Total Well Depth (ft bgs)	Top Screen Elevation (ft msl)	Bottom Screen Elevation (ft msl)	Screen Length (ft)
90DP0003	251204.92	868200.12	103	102.6	216	-103.11	-113.11	10
90DP0006	251313.02	868379.37	125	124.64	163	-27.56	-37.56	10
90DP0008	251542.89	868229.7	113	112.26	215	-92.38	-102.38	10
90DP0009	251190.37	868423.41	122	121.41	160	-28.48	-38.48	10
90DP0012A	251912.65	867952.33	79	78.68	199	-110.11	-120.11	10
90DP1003	251202.75	868202.23	103	102.58	162	-47.74	-57.74	10
90EW0014*	252256.42	868543.3	151	143.48	212	-35.59	-55.59	20
90EW0015*	252050.19	868532.71	153	145.09	213	-35.34	-55.34	20
90EW0017*	251793.33	868617.82	151	143.34	211	-34.77	-54.77	20
90EW0018*	251716.96	868811.42	139	131.75	197	-32.78	-52.78	20
90EW0019**	251408.77	868923.48	145	137.23	212	-43.77	-62.07	18
90EW0024	250728.64	869255.12	142	134.75	195	12.67	-47.33	60
90EW0025**	250795.42	869399.98	148	140.17	208	-36.28	-55.4	19
90EW0026**	250866.46	869557.88	150	142.23	211	-34.37	-55.58	21
90EW0027	250926.59	869687.35	151	143.13	211	5.28	-54.72	60
90EW0031	251154.2	868123.6	84	77.24	117	-14.76	-30.4	16
90MP0060A	251174.62	868100.36	83	83.07	173	-87.25	-89.75	3
90MP0060B	251174.62	868100.37	83	83.19	154	-67.75	-70.25	3
90MP0060C	251174.62	868100.38	83	83.19	129	-43.25	-45.75	3
90MW0007	253701.1	868181.62	157	159.48	184	-21.8	-26.8	5
90MW0015	251912.69	867956.79	79	78.97	102	-17.2	-22.2	5
90MW0020	251880.6	869057.13	140	139.56	154	-8.5	-13.5	5
90MW0027	251376.28	868480.47	137	136.39	168	-26.61	-31.11	5
90MW0040	250984.92	869028.58	148	147.39	193	-39.94	-44.85	5
90MW0047	250486	868811	138	137.6	189	-46.52	-51.58	5
90MW0050	250978.83	868343.92	83	82.67	91	-2.7	-7.57	5
90MW0053	250840.91	869430.82	150	149.75	194	-39.19	-44.09	5
90MW0055	250870.19	869417.82	151	150.7	225	-68.15	-73.15	5
90MW0056	250476.61	868821.05	138	139.79	219	-74.93	-79.93	5
90MW0064	250673.9	870280.44	144	143.28	210	-61.45	-66.45	5
90MW0066	250478.54	869438.32	132	132.11	194	-56.14	-61.14	5
90MW0066A	250473.24	869443.82	132	131.7	145	-7.59	-12.59	5
90MW0076	250979.7	869021.2	148	147.43	159	-7.67	-10.67	3
90MW0077	250683.3	870269.1	144	143.99	153	-3.61	-8.61	5
90MW0078	250677.9	869195.6	141	140.41	152	-6.43	-11.43	5
90MW0079B	250932.3	869758.6	151	150.95	191	-34.79	-39.79	5
90MW0079C	250920.2	869762.4	151	150.98	225	-68.8	-73.8	5
90MW0084A	250533.9	869838.5	136	135.53	165	-24.24	-29.24	5
90MW0100A	250913.07	868356.93	81	80.53	160	-73.95	-78.77	5
90MW0100B	250913.37	868357.12	81	80.52	105	-18.86	-23.68	5
90MW0103A	250629.36	868409.45	71	70.19	120	-44.05	-48.85	5
90MW0106A	251471.96	868915.7	143	142.08	228	-79.95	-84.74	5
90MW0106B	251461.49	868918.46	143	142.86	215	-66.63	-71.42	5
90MW0106C	251472.01	868915.68	143	142.15	195	-47.14	-52.19	5
90MW0106D	251461.6	868918.05	143	142.91	180	-31.7	-36.7	5
90MW0107A	250965.98	869191.73	151	150.89	210	-53.28	-58.11	5
90MW0107B	250975.96	869196.57	151	151.04	195	-38.93	-43.74	5
90MW0200B	251127.47	869018.22	149	148.95	238	-82.93	-87.76	5
90MW0200C	251127.22	869018.55	149	148.94	190	-35.86	-40.76	5
90MW0201A	251526.34	868776.54	147	147.04	261	-107.91	-112.53	5
90MW0201B	251526.48	868776.29	147	147.03	206	-52.91	-57.53	5
90MW0201C	251526.35	868776.24	147	146.78	185	-32.6	-37.53	5

**Table 1**  
**FS-12 Well Construction and Surface Water Sampling Location Information**  
**FS-12 2009 Summary Letter Report**

Location	Northing Coordinate on Surface (ft)	Easting Coordinate on Surface (ft)	Surface Elevation (ft msl)	Measuring Point Elevation (ft msl)	Total Well Depth (ft bgs)	Top Screen Elevation (ft msl)	Bottom Screen Elevation (ft msl)	Screen Length (ft)
90MW0202B	251357.06	868488.43	136	135.68	216	-74.2	-79.01	5
90MW0202C	251357.23	868488.4	136	135.68	145	-4.08	-9.01	5
90SW0001	249001.11	867841.18	66	N/A	N/A	N/A	N/A	N/A
90SW0002	250784.89	867995.51	66	N/A	N/A	N/A	N/A	N/A
96SV0004	254398	868197	159	158.2	100	89.2	59.2	30
96SV0006	254528	868534	160	159.4	105	84.7	54.7	30
96SV0013	254740	868258	162	157.9	105	86.9	56.9	30
MW-169M1	251389.65	867867.88	70	69.84	159	-83.92	-88.92	5
MW-169M2	251389.65	867868	70	69.98	119	-43.42	-48.42	5
MW-242M2	254257.72	868205.7	159	158.2	175	-6.12	-16.12	10

Data Source: AFCEE, March 2010, MMR-AFCEE Data Warehouse

Notes:

\*Extraction well screen shortened to 20 feet by installation of packers in December 2006 as part of the wellfield optimization (2006 Scenario 01).

\*\* Extraction well screens shortened from 60 feet to current screen length by installation of packers in 2005 (2005 Scenario 02).

Key:

bgs = below ground surface

FS-12 = Fuel Spill-12

ft = feet

msl = mean sea level

N/A = not applicable

**Table 2**  
**FS-12 Groundwater and Surface Water Monitoring Results**  
**FS-12 2009 Summary Letter Report**

Location	Date	Laboratory Analyses		Field Parameters					
		EDB (µg/L) MMCL = 0.02	Benzene (µg/L) MCL = 5	Temp (°C)	pH (std)	DO (mg/L)	SpC (µS/cm)	ORP (mV)	Turbidity (NTU)
90DP0003	5/7/2009	ND	NS	--	--	--	--	--	--
90DP0003	12/18/2009	ND	NS	--	--	--	--	--	--
90DP0006	5/20/2009	<b>0.175</b>	NS	12.52	8.57	2.91	65	-233.7	127.6
90DP0006	12/17/2009	<b>0.101</b>	NS	7.36	7.82	9.89	62	-196.8	133.9
90DP0008	5/15/2009	BRL	NS	10.96	7.99	7.54	34	215.4	62.9
90DP0009	5/7/2009	<b>0.172</b>	NS	--	--	--	--	--	--
90DP0009	12/17/2009	<b>0.022</b>	NS	9.45	8.56	2.61	65	-205.4	96.8
90DP0012A	5/15/2009	ND	NS	10.16	6.88	3.12	85	-132.0	12.1
90DP1003	5/15/2009	<b>0.808</b>	NS	12.38	7.69	2.23	62	-382.1	88.4
90EW0014	5/13/2009	BRL	NS	10.69	6.10	169	138	26.2	53.8
90EW0014	12/16/2009	0.011	NS	8.84	6.00	3.8	127	135.2	2.8
90EW0015	5/13/2009	<b>0.036</b>	NS	10.05	6.07	5.85	85	78.4	164.7
90EW0015	12/16/2009	<b>0.033</b>	NS	9.16	6.22	8.22	70	65.4	5.7
90EW0017	5/13/2009	<b>0.354</b>	NS	10.37	6.14	6.86	70	81.9	46.1
90EW0017	12/16/2009	<b>0.188</b>	NS	9.43	6.18	8.14	63	89.5	1.7
90EW0018	5/13/2009	<b>0.074</b>	NS	10.95	6.18	7.12	71	78.9	64.9
90EW0018	12/16/2009	<b>0.05</b>	NS	9.34	6.22	8.54	66	101.8	4.3
90EW0019	5/13/2009	<b>1.09</b>	NS	10.50	5.79	10.34	74	152.8	6.1
90EW0019	12/16/2009	<b>0.677</b>	NS	9.36	6.87	9.94	69	147.6	9.9
90EW0024	1/5/2009	ND	NS	12.87	6.10	5.86	124	178.2	27.1
90EW0024	5/20/2009	ND	NS	14.08	6.37	5.56	82	94.6	7.0
90EW0024	12/23/2009	ND	NS	12.11	6.18	4.62	90	54.0	66.5
90EW0025	5/13/2009	<b>0.357</b>	NS	11.36	5.91	7.86	79	143.5	6.1
90EW0025	12/16/2009	<b>0.316</b>	NS	10.12	6.22	7.47	75	145.5	10.6
90EW0026	5/13/2009	<b>0.57</b>	NS	11.30	5.97	9.08	72	155.4	6.3
90EW0026	12/16/2009	<b>0.393</b>	NS	10.03	6.19	9.53	69	139.6	1.4
90EW0027	5/13/2009	ND	NS	11.98	6.11	7.06	82	89.8	155.3
90EW0027	12/16/2009	ND	NS	11.02	6.32	8.44	78	104.8	5.0
90EW0031	5/13/2009	<b>0.067</b>	NS	11.59	6.19	10.84	76	126.9	6.8
90EW0031	12/16/2009	<b>0.065</b>	NS	10.51	6.07	9.98	76	153.6	0.9
90MP0060A	5/12/2009	ND	NS	10.78	6.44	3.21	79	133.2	1.2
90MP0060A	12/28/2009	ND	NS	11.45	7.27	2.88	78	143.4	3.0
90MP0060B	5/12/2009	<b>0.029</b>	NS	10.90	6.36	6.76	71	137.7	0.7
90MP0060B	12/28/2009	0.017	NS	11.47	6.51	6.93	69	106.1	3.3
90MP0060C	5/12/2009	ND	NS	10.78	6.15	10.05	84	159.9	1.7
90MP0060C	12/28/2009	ND	NS	11.33	6.30	9.29	85	101.2	1.2
90MW0007	5/21/2009	ND	NS	--	--	--	--	--	--
90MW0015	5/21/2009	ND	NS	--	--	--	--	--	--
90MW0020	5/21/2009	<b>0.17</b>	NS	--	--	--	--	--	--
90MW0027	1/5/2009	0.017	NS	--	--	--	--	--	--
90MW0027	5/21/2009	0.015	NS	--	--	--	--	--	--
90MW0027	12/18/2009	0.017	NS	--	--	--	--	--	--
90MW0040	5/20/2009	<b>1.4</b>	NS	15.79	6.01	10.83	55	193.5	3.8
90MW0047	5/21/2009	ND	NS	--	--	--	--	--	--
90MW0050	5/21/2009	ND	NS	--	--	--	--	--	--
90MW0053	5/21/2009	<b>0.169</b>	NS	--	--	--	--	--	--
90MW0055	5/20/2009	<b>23.1</b>	NS	14.78	6.29	1.05	80	53.2	1.1
90MW0056	5/21/2009	ND	NS	--	--	--	--	--	--
90MW0064	5/21/2009	ND	NS	--	--	--	--	--	--

**Table 2**  
**FS-12 Groundwater and Surface Water Monitoring Results**  
**FS-12 2009 Summary Letter Report**

Location	Date	Laboratory Analyses		Field Parameters					
		EDB (µg/L) MMCL = 0.02	Benzene (µg/L) MCL = 5	Temp (°C)	pH (std)	DO (mg/L)	SpC (µS/cm)	ORP (mV)	Turbidity (NTU)
90MW0066	5/21/2009	ND	NS	--	--	--	--	--	--
90MW0066A	5/21/2009	ND	NS	--	--	--	--	--	--
90MW0076	5/20/2009	ND	NS	13.72	5.73	9.31	67	231.7	0.6
90MW0077	5/21/2009	ND	NS	--	--	--	--	--	--
90MW0078	5/21/2009	ND	NS	--	--	--	--	--	--
90MW0079B	5/21/2009	ND	NS	--	--	--	--	--	--
90MW0079C	5/21/2009	ND	NS	--	--	--	--	--	--
90MW0084A	5/21/2009	ND	NS	--	--	--	--	--	--
90MW0100A	5/21/2009	ND	NS	--	--	--	--	--	--
90MW0100B	5/21/2009	ND	NS	--	--	--	--	--	--
90MW0103A	5/21/2009	ND	NS	--	--	--	--	--	--
90MW0103A	5/21/2009	ND	NS	--	--	--	--	--	--
90MW0106A	5/7/2009	<b>0.705</b>	NS	--	--	--	--	--	--
90MW0106A	9/29/2009	<b>0.022</b>	NS	12.75	6.68	0.37	94	-18.6	5.2
90MW0106A	12/17/2009	<b>0.308</b>	NS	--	--	--	--	--	--
90MW0106B	5/7/2009	<b>14.7</b>	NS	--	--	--	--	--	--
90MW0106B	5/20/2009	<b>13.1</b>	NS	13.80	6.39	4.95	78	148.1	8.8
90MW0106B	9/30/2009	<b>11</b>	NS	12.74	6.52	4.3	84	200.2	1.3
90MW0106B	12/17/2009	<b>9.07</b>	NS	--	--	--	--	--	--
90MW0106C	5/7/2009	<b>0.571</b>	NS	--	--	--	--	--	--
90MW0106C	9/30/2009	<b>1.03</b>	NS	12.61	5.90	9.09	81	213.4	139.9
90MW0106C	12/17/2009	<b>1.2</b>	NS	--	--	--	--	--	--
90MW0106D	5/20/2009	ND	NS	--	--	--	--	--	--
90MW0107A	5/7/2009	<b>0.214</b>	NS	--	--	--	--	--	--
90MW0107A	5/20/2009	<b>0.053</b>	NS	14.87	5.61	10.1	66	239.9	3.5
90MW0107A	12/17/2009	<b>0.374</b>	NS	--	--	--	--	--	--
90MW0107B	1/20/2009	ND	NS	12.87	6.18	11.21	101	227.1	0.9
90MW0107B	5/7/2009	BRL	NS	--	--	--	--	--	--
90MW0107B	12/17/2009	BRL	NS	--	--	--	--	--	--
90MW0200B	5/7/2009	ND	NS	--	--	--	--	--	--
90MW0200B	12/18/2009	ND	NS	--	--	--	--	--	--
90MW0200C	5/7/2009	<b>3.11</b>	NS	--	--	--	--	--	--
90MW0200C	12/18/2009	<b>1.62</b>	NS	--	--	--	--	--	--
90MW0201A	5/20/2009	ND	NS	--	--	--	--	--	--
90MW0201B	1/5/2009	<b>22.4</b>	NS	--	--	--	--	--	--
90MW0201B	5/7/2009	<b>14.2</b>	NS	--	--	--	--	--	--
90MW0201B	12/18/2009	<b>13.2</b>	NS	--	--	--	--	--	--
90MW0201C	1/5/2009	BRL	NS	--	--	--	--	--	--
90MW0201C	5/7/2009	BRL	NS	--	--	--	--	--	--
90MW0201C	12/18/2009	BRL	NS	--	--	--	--	--	--
90MW0202B	5/20/2009	ND	NS	--	--	--	--	--	--
90MW0202C	1/5/2009	<b>0.075</b>	NS	--	--	--	--	--	--
90MW0202C	5/7/2009	<b>0.122</b>	NS	--	--	--	--	--	--
90MW0202C	12/18/2009	<b>0.075</b>	NS	--	--	--	--	--	--
90SW0001*	5/11/2009	ND	NS	16.26	6.85	10.73	65		
90SW0001*	7/13/2009	ND	NS	21.90	6.98	9.1	62	128.8	13.0
90SW0002*	5/11/2009	ND	NS	15.09	6.78	10.99	66		
90SW0002*	7/13/2009	ND	NS	22.38	7.14	9.02	62	92.3	0.4
96SV0004	5/18/2009	NS	1.1	15.58	6.49	0.41	282	-121.1	5.7

**Table 2**  
**FS-12 Groundwater and Surface Water Monitoring Results**  
**FS-12 2009 Summary Letter Report**

Location	Date	Laboratory Analyses		Field Parameters					
		EDB (µg/L) MMCL = 0.02	Benzene (µg/L) MCL = 5	Temp (°C)	pH (std)	DO (mg/L)	SpC (µS/cm)	ORP (mV)	Turbidity (NTU)
96SV0006	5/18/2009	NS	ND	15.47	6.31	0.76	165	-83.7	5.8
96SV0013	5/18/2009	NS	ND	14.56	6.20	0.89	233	-96.0	11.1
MW-169M1	5/15/2009	ND	NS	12.84	6.67	9.83	56	77.6	13.4
MW-169M2	5/12/2009	ND	NS	--	--	--	--	--	--
MW-242M2	5/22/2009	BRL	NS	12.59	5.95	0.83	129	32.0	0.9

Data Source: AFCEE, March 2010, MMR-AFCEE Data Warehouse

**Notes:**

MMCL from Massachusetts Department of Environmental Protection (MassDEP) web page, <http://www.mass.gov/dep/water/dwstand.pdf>.

MCLs from Environmental Protection Agency (EPA) web page, <http://www.epa.gov/safewater/contaminants/index.html>.

-- : Sample collected through the use of passive diffusion bag sampler; field parameter collection not performed.

**Bold** values indicate MMCL exceedances.

EDB analyzed by EPA method 504.1 and benzene analyzed by EPA method 8260B.

\* Surface water result compared to the Massachusetts Department of Environmental Protection (MassDEP) Ambient Water Quality Criteria (AWQC) Standard of 9,600 µg/L for EDB, AWQC table at 310 CMR 40.1516(1) from MassDEP web page <http://www.mass.gov/dep/service/regulations/310cmr40.pdf>.

**Key:**

BRL = below the reporting limit

°C = degrees Celsius

DO = dissolved oxygen

EDB = ethylene dibromide

FS-12 = Fuel Spill-12

MCL = Maximum Contaminant Level

MMCL = Massachusetts MCL

mg/L = milligrams per liter

mV = millivolts

ND = not detected

NS = not sampled

NTU = nephelometric turbidity units

ORP = oxidation-reduction potential

SpC = specific conductance

Temp = temperature

µg/L = micrograms per liter

µS/cm = microsiemens per centimeter



**Table 3**  
**FS-12 Meeting Presentations**  
**FS-12 2009 Summary Letter Report**

**Technical Update Meetings**

08 April 2008	FS-12 Semiannual SPEIM Data Presentation
10 June 2008	FS-12 Semiannual SPEIM Data Presentation Follow Up
08 July 2008	FS-12 Data Presentation Follow Up
16 September 2008	FS-12 Annual SPEIM Data Presentation
09 December 2008	FS-12 Data Presentation Follow Up

**MMR Cleanup Team (MMRCT)**

No Presentations

**SMB Meetings**

No Presentations

**Conferences**

20-21 October 2009	<i>Optimization of a Multi-Well Groundwater Pump and Treat System: Managing Hydraulic Stagnation Zones</i> at the 25th Annual International Conference on Soils, Sediments, Water, and Energy, University of Massachusetts, Amherst, MA
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**Table 4**  
**FS-12 Treatment Plant Sampling Results**  
**FS-12 2009 Summary Letter Report**

Month of Event	Sample Date	Location Identification	Sample Location	Laboratory Analyses		Field Parameters					
				Benzene (µg/L) MCL = 5	EDB (µg/L) MMCL = 0.02	Temp (°C)	SpC (µS/cm)	DO (mg/L)	pH (std)	ORP (mV)	Turbidity (NTU)
February	26-Jan-09	90PLT01001	Influent	NS	0.513	--	--	--	--	--	--
	26-Jan-09	90PLT01023	Post-101A (lag)	NS	ND	--	--	--	--	--	--
	26-Jan-09	90PLT01042	Post-103B (lag)	NS	BRL	--	--	--	--	--	--
	26-Jan-09	90PLT01033	Post-102B (Lead Vessel)	NS	ND	--	--	--	--	--	--
	26-Jan-09	90PLT01053	Effluent	NS	ND	--	--	--	--	--	--
March	23-Feb-09	90PLT01001	Influent	ND	0.537	--	--	--	--	--	--
	23-Feb-09	90PLT01023	Post-101A (lag)	NS	ND	--	--	--	--	--	--
	23-Feb-09	90PLT01042	Post-103B (lag)	NS	0.013	--	--	--	--	--	--
	23-Feb-09	90PLT01033	Post-102B (Lead Vessel)	NS	BRL	--	--	--	--	--	--
	23-Feb-09	90PLT01053	Effluent	ND	ND	--	--	--	--	--	--
Carbon was replaced in 103A (lead vessel) on 10 March 2009. Following carbon replacement, vessel 103A was aligned as lag vessel and 103B as the lead vessel.											
April	25-Mar-09	90PLT01001	Influent	NS	0.529	--	--	--	--	--	--
	25-Mar-09	90PLT01023	Post-101A (lag)	NS	ND	--	--	--	--	--	--
	25-Mar-09	90PLT01041	Post-103A (lag)	NS	ND	--	--	--	--	--	--
	25-Mar-09	90PLT01033	Post-102B (Lead Vessel)	NS	BRL	--	--	--	--	--	--
	25-Mar-09	90PLT01053	Effluent	NS	ND	--	--	--	--	--	--
May	24-Apr-09	90PLT01001	Influent	NS	0.487	--	--	--	--	--	--
	24-Apr-09	90PLT01023	Post-101A (lag)	NS	ND	--	--	--	--	--	--
	24-Apr-09	90PLT01041	Post-103A (lag)	NS	ND	--	--	--	--	--	--
	24-Apr-09	90PLT01033	Post-102B (Lead Vessel)	NS	BRL	--	--	--	--	--	--
	24-Apr-09	90PLT01053	Effluent	NS	ND	--	--	--	--	--	--
June	26-May-09	90PLT01001	Influent	ND	0.481	10.81	74	8.03	6.58	185.5	0
	26-May-09	90PLT01023	Post-101A (lag)	NS	ND	10.96	73	8.18	6.14	203.3	0
	26-May-09	90PLT01041	Post-103A (lag)	NS	ND	10.97	73	8.23	6.06	209.0	0
	26-May-09	90PLT01033	Post-102B (Lead Vessel)	NS	BRL	10.98	73	8.05	5.99	214.7	0
	26-May-09	90PLT01053	Effluent	ND	BRL	10.91	73	8.25	6.39	171.2	0
Resample	02-Jun-09	90PLT01053	Effluent	NS	ND	--	--	--	--	--	--
July	24-Jun-09	90PLT01001	Influent	NS	0.378	--	--	--	--	--	--
	24-Jun-09	90PLT01023	Post-101A (lag)	NS	ND	--	--	--	--	--	--
	24-Jun-09	90PLT01041	Post-103A (lag)	NS	ND	--	--	--	--	--	--
	24-Jun-09	90PLT01033	Post-102B (Lead Vessel)	NS	ND	--	--	--	--	--	--
	24-Jun-09	90PLT01053	Effluent	NS	ND	--	--	--	--	--	--
August	27-Jul-09	90PLT01001	Influent	NS	0.472	--	--	--	--	--	--
	27-Jul-09	90PLT01023	Post-101A (lag)	NS	ND	--	--	--	--	--	--
	27-Jul-09	90PLT01041	Post-103A (lag)	NS	ND	--	--	--	--	--	--
	27-Jul-09	90PLT01033	Post-102B (Lead Vessel)	NS	ND	--	--	--	--	--	--
	27-Jul-09	90PLT01053	Effluent	NS	ND	--	--	--	--	--	--

**Table 4**  
**FS-12 Treatment Plant Sampling Results**  
**FS-12 2009 Summary Letter Report**

Month of Event	Sample Date	Location Identification	Sample Location	Laboratory Analyses		Field Parameters					
				Benzene (µg/L) MCL = 5	EDB (µg/L) MMCL = 0.02	Temp (°C)	SpC (µS/cm)	DO (mg/L)	pH (std)	ORP (mV)	Turbidity (NTU)
September	28-Aug-09	90PLT01001	Influent	ND	<b>0.492</b>	--	--	--	--	--	--
	28-Aug-09	90PLT01023	Post-101A (lag)	NS	0.011J	--	--	--	--	--	--
	28-Aug-09	90PLT01041	Post-103A (lag)	NS	ND	--	--	--	--	--	--
	28-Aug-09	90PLT01033	Post-102B (Lead Vessel)	NS	ND	--	--	--	--	--	--
	28-Aug-09	90PLT01053	Effluent	ND	ND	--	--	--	--	--	--
October	25-Sep-09	90PLT01001	Influent	NS	<b>0.358</b>	--	--	--	--	--	--
	25-Sep-09	90PLT01023	Post-101A (lag)	NS	0.016	--	--	--	--	--	--
	25-Sep-09	90PLT01041	Post-103A (lag)	NS	ND	--	--	--	--	--	--
	25-Sep-09	90PLT01033	Post-102B (Lead Vessel)	NS	ND	--	--	--	--	--	--
	25-Sep-09	90PLT01053	Effluent	NS	ND	--	--	--	--	--	--
<b>Carbon was replaced in 101B (lead vessel) on 15 October 2009. Following carbon replacement, vessel 101B was aligned as lag vessel and 101A as the lead vessel.</b>											
November	27-Oct-09	90PLT01001	Influent	NS	<b>0.426</b>	--	--	--	--	--	--
	27-Oct-09	90PLT01024	Post-101B (lag)	NS	ND	--	--	--	--	--	--
	27-Oct-09	90PLT01041	Post-103A (lag)	NS	ND	--	--	--	--	--	--
	27-Oct-09	90PLT01033	Post-102B (Lead Vessel)	NS	BRL	--	--	--	--	--	--
	27-Oct-09	90PLT01053	Effluent	NS	ND	--	--	--	--	--	--
December	24-Nov-09	90PLT01001	Influent	ND	<b>0.421</b>	10.70	77	8.91	5.77	60.0	0.1
	24-Nov-09	90PLT01024	Post-101B (lag)	NS	ND	10.82	76	7.24	5.78	59.2	0
	24-Nov-09	90PLT01041	Post-103A (lag)	NS	ND	10.81	76	7.65	5.77	61.2	0
	24-Nov-09	90PLT01033	Post-102B (Lead Vessel)	NS	ND	10.82	76	6.89	5.76	62.8	0
	24-Nov-09	90PLT01053	Effluent	ND	ND	10.67	76	9.69	5.76	69.2	0
January	28-Dec-09	90PLT01001	Influent	NS	<b>0.374</b>	--	--	--	--	--	--
	28-Dec-09	90PLT01024	Post-101B (lag)	NS	ND	--	--	--	--	--	--
	28-Dec-09	90PLT01041	Post-103A (lag)	NS	ND	--	--	--	--	--	--
	28-Dec-09	90PLT01033	Post-102B (Lead Vessel)	NS	ND	--	--	--	--	--	--
	28-Dec-09	90PLT01053	Effluent	NS	ND	--	--	--	--	--	--

Data Source: AFCEE, March 2010, MMR-AFCEE Data Warehouse.

**Notes:**

VOC samples (including benzene) are collected quarterly from the influent and effluent only and analyzed by EPA Method 8260B.

EDB samples analyzed by EPA Method 504.1

**Bold** indicates value exceeds MMCL.

Field parameters (pH, temperature, DO, SpC, turbidity, and ORP) are recorded semiannually at influent, post-GAC at each active GAC vessel, and plant effluent sampling locations. The measurements are taken using a flow-through cell and the Yellow Springs Instrument (YSI).

--: Field parameters were not collected.

\* Confirmatory samples taken after a BRL was reported in plant effluent collected on 29 January 2008.

**Key:**

BRL = below reporting limit

°C = degrees Celsius

DO = dissolved oxygen

EDB = ethylene dibromide (analyzed by Method E. 504.1)

FS-12 = Fuel Spill-12

GAC = granular activated carbon

J = estimated value

mg/L = milligrams per liter

MCL = Maximum Contaminant Level

MMCL = Massachusetts MCL

mV = millivolts

ND = not detected

NS = not sampled

NTU = nephelometric turbidity units

ORP = oxidation-reduction potential

std = standard units

SpC = specific conductance

Temp = temperature

VOC = volatile organic compounds

µg/L = micrograms per liter

µS/cm = microsiemens per centimeter

Table 5  
FS-12 Treatment System Flow Rates  
FS-12 2009 Summary Letter Report

Week Ending	Extraction Wells				Total	Reinjection Wells																					
	90EW0019	90EW0025	90EW0026	90EW0031		90RIW0007	90RIW0008	90RIW0009	90RIW0013	90RIW0014	90RIW0015	90RIW0016	90RIW0017	90RIW0018	90RIW0020	90RIW0021	90RIW0022	90RIW0023	90RIW0024	90RIW0025	90RIW0026	90RIW0027	90RIW0028	90RIW0029	90RIW0030		
7-Jan-09	119	51	70	120	360	18	18	18	37	53	18	37	18	37	41	37	18	18	11	18	18	28	37	53	28		
14-Jan-09	119	51	70	120	359	18	18	18	37	53	18	37	18	37	41	37	18	18	11	18	18	28	37	53	28		
21-Jan-09	119	51	70	120	359	18	18	18	37	53	18	37	18	37	41	37	18	18	11	18	18	28	37	53	28		
28-Jan-09	119	50	70	120	359	18	18	18	37	53	18	37	18	37	41	37	18	18	11	18	18	27	37	53	27		
4-Feb-09	119	50	70	120	359	18	18	18	37	53	18	37	18	37	41	37	18	18	11	18	18	27	37	53	27		
11-Feb-09	118	49	66	120	353	18	18	18	36	53	18	36	18	36	41	36	18	18	11	18	18	27	36	53	27		
18-Feb-09	118	50	70	120	358	18	18	18	37	53	18	37	18	37	41	37	18	18	11	18	18	27	37	53	27		
25-Feb-09	118	50	70	120	358	18	18	18	36	53	18	37	18	37	41	37	18	18	11	18	18	27	37	53	27		
4-Mar-09	117	50	70	119	357	18	18	18	36	53	18	36	18	36	41	36	18	18	11	18	18	27	36	53	27		
11-Mar-09	117	50	70	120	357	18	18	18	37	53	18	37	18	37	41	37	18	18	11	18	18	27	37	53	27		
18-Mar-09	117	50	70	120	357	18	18	18	37	50	18	37	18	37	41	37	18	18	11	18	18	28	37	51	28		
25-Mar-09	117	50	70	120	357	20	20	20	40	20	20	40	20	40	45	40	20	20	20	20	20	30	40	30	30		
1-Apr-09	116	50	70	120	356	20	20	20	40	20	20	40	20	40	45	40	20	20	20	20	20	30	40	30	30		
8-Apr-09	116	50	70	120	356	19	19	19	38	19	19	38	19	38	43	38	19	19	19	19	19	29	38	29	29		
15-Apr-09	116	50	70	120	356	20	20	20	40	20	20	40	20	40	45	40	20	20	20	20	20	30	40	30	30		
22-Apr-09	105	47	66	113	330	19	19	19	37	19	19	38	19	37	42	38	19	19	19	19	19	28	37	28	28		
29-Apr-09	116	50	70	120	356	20	20	20	40	20	20	40	20	40	45	40	20	20	20	20	20	30	40	30	30		
6-May-09	115	50	70	120	355	20	20	20	40	20	20	40	20	40	45	40	20	20	20	20	20	30	40	30	30		
13-May-09	115	49	70	119	353	20	20	20	40	20	20	40	20	40	45	40	20	20	20	20	20	30	40	30	30		
20-May-09	114	49	69	119	352	20	20	20	40	20	20	40	20	40	40	40	20	20	20	20	20	30	40	30	30		
27-May-09	115	49	70	120	354	20	20	20	40	20	20	40	20	40	46	40	20	20	20	20	20	30	40	30	30		
3-Jun-09	114	49	70	120	354	20	20	20	40	20	20	40	20	40	45	40	20	20	20	20	20	30	40	30	30		
10-Jun-09	112	49	69	118	348	20	20	20	39	20	20	39	20	39	44	39	20	20	20	20	20	29	39	29	29		
17-Jun-09	114	50	70	120	354	20	20	20	40	20	20	40	20	40	45	40	20	20	20	20	20	30	40	30	30		
24-Jun-09	114	49	70	120	354	20	20	20	40	20	20	40	20	40	45	40	20	20	20	20	20	30	40	30	30		
1-Jul-09	113	49	70	120	353	20	20	20	40	20	20	40	20	40	45	40	20	20	20	20	20	30	40	30	30		
8-Jul-09	113	49	70	120	353	20	20	20	40	20	20	40	20	40	45	40	20	20	20	20	20	30	40	30	30		
15-Jul-09	113	50	70	120	354	20	20	20	40	20	20	40	20	40	45	40	20	20	20	20	20	30	40	30	30		
22-Jul-09	111	49	69	119	349	20	20	20	39	19	19	40	20	39	44	39	20	19	19	19	20	29	39	29	29		
29-Jul-09	113	50	70	118	351	20	20	20	39	20	20	40	20	39	44	40	20	20	20	20	20	29	39	29	29		
5-Aug-09	112	51	70	120	353	20	20	20	40	20	20	40	20	40	45	40	20	20	20	20	20	30	40	30	30		
12-Aug-09	112	51	70	120	353	20	20	20	40	20	20	40	20	40	45	40	20	20	20	20	20	30	40	30	30		
19-Aug-09	112	50	70	120	352	20	20	20	40	20	20	40	20	40	45	40	20	20	20	20	20	30	40	30	30		
26-Aug-09	112	50	70	120	351	20	20	20	40	20	20	40	20	40	45	40	20	20	20	20	20	30	40	30	30		
2-Sep-09	111	50	70	120	351	20	20	20	40	20	20	40	20	40	45	40	20	20	20	20	20	30	40	30	30		
9-Sep-09	111	51	70	120	352	20	20	20	40	20	20	40	20	40	45	40	20	20	20	20	20	30	40	30	30		
16-Sep-09	111	51	70	120	352	20	20	20	40	20	20	40	20	40	45	40	20	20	20	20	20	30	40	30	30		
23-Sep-09	109	51	69	118	347	20	20	20	39	20	20	39	20	39	44	39	20	19	19	19	19	29	39	29	29		
30-Sep-09	111	51	70	119	351	20	20	20	40	20	20	40	20	40	45	40	20	20	20	20	20	30	40	30	30		
7-Oct-09	110	51	70	120	351	20	20	20	39	20	20	39	20	39	44	39	20	20	20	20	20	30	39	30	30		
14-Oct-09	110	50	70	120	350	20	20	20	40	20	20	40	20	40	45	40	20	20	20	20	20	30	40	30	30		
21-Oct-09	110	50	70	120	349	19	19	19	39	19	19	39	19	39	43	39	19	19	19	19	19	29	39	29	29		
28-Oct-09	88	40	56	96	280	16	16	16	32	16	16	32	16	32	35	32	17	16	16	16	16	24	32	24	24		
4-Nov-09	110	51	70	120	350	20	20	20	40	20	20	40	20	40	45	40	20	20	20	20	20	30	40	30	30		
11-Nov-09	109	51	70	120	350	20	20	20	40	20	20	40	20	40	45	40	20	20	20	20	20	30	40	30	30		
18-Nov-09	109	50	70	120	349	20	20	20	40	20	20	40	20	40	45	40	20	20	20	20	20	30	40	33	30		
25-Nov-09	109	50	70	120	349	19	19	19	39	19	19	39	19	39	44	39	19	19	19	19	19	29	39	42	29		
2-Dec-09	109	50	70	120	348	19	19	19	39	19	19	39	19	39	43	39	19	19	19	19	19	29	39	37	29		
9-Dec-09	108	50	70	120	348	19	19	19	38	19	19	38	19	38	43	38	19	19	19	19	19	29	38	29	28		
1																											

Data Source: AFCÉE, February 2010, AFCÉE-MMR Data Warehouse.

Notes:

Only wells that were operational in 2009 are listed.

All flow rates are in gallons per minute (gpm).

Any downtime due to routine and non-routine operation and maintenance activities is included in the average flow rates.

Due to small-scale inaccuracies of the electronic flow rate meters, removal of relatively small amounts of water at the plant and use of operator log-book data (when electronic flow data is not available) the recorded influent rates may not equal the recorded effluent flow rates.

\* Total flow rate at injection wells includes approximately 195 gpm of treated J-3 Range effluent.

Key:  
gpm = gallons per minute

**Table 6**  
**FS-12 Treatment System Downtime Summary**  
**FS-12 2009 Summary Letter Report**

Date	Hours Off-Line	Reason
2/5/2009	3.75	System off due to flooded vault.
4/20/2009	14.17	System off due to loss of communication to wells.
7/20/2009	4.58	System shutdown for ethernet swap and installation of hardware.
7/21/2009	3.75	System shutdown for ethernet swap and installation of hardware.
7/22/2009	3.75	System shutdown for programming/hardware upgrade.
7/23/2009	3.25	System shutdown for ethernet swap.
8/6/2009	3.33	System shut down for communication swap to ethernet. Troubleshoot program and debug.
9/21/2009	2.33	System shut down for energy reduction event.
10/24/2009	32.38	Plant tripped during rain storm due to a power failure.
12/20/2009	56.32	Plant tripped during due to a power failure caused by a snow storm.
12/22/2009	195.32	90EW0031 off due to communications issue with MCC-1.
12/22/2009	196.50	90RIW0013 flow off due to bad actuator and valve.
12/22/2009	45.67	Plant running, still no communication with MCC-1. 90EW0031 off.

Key:

MCC = Master Control Center

**Table 7**  
**FS-12 Treatment System Mass Removal Summary**  
**FS-12 2009 Summary Letter Report**

Date	EDB Monthly Removal (lbs)	EDB Cumulative Removal (lbs)	Benzene Monthly Removal (lbs)	Benzene Cumulative Removal (lbs)
Sep-97	1.48	1.48	4.06	4.06
Oct-97	7.39	8.87	18.04	22.10
Nov-97	5.14	14.01	11.32	33.42
Dec-97	7.07	21.08	11.66	45.08
Jan-98	7.27	28.35	5.51	50.59
Feb-98	7.34	35.69	2.51	53.10
Mar-98	6.58	42.27	1.14	54.24
Apr-98	5.10	47.37	0.39	54.63
May-98	5.00	52.37	0.25	54.87
Jun-98	5.73	58.10	0.24	55.11
Jul-98	4.25	62.35	0.27	55.38
Aug-98	3.89	66.24	0.51	55.89
Sep-98	3.75	69.99	0.33	56.22
Oct-98	3.19	73.17	0.15	56.37
Nov-98	2.74	75.91	0.02	56.39
Dec-98	3.09	79.00	0.00	56.39
Jan-99	2.39	81.39	0.00	56.39
Feb-99	1.45	82.84	0.01	56.40
Mar-99	1.28	84.11	0.05	56.44
Apr-99	1.04	85.16	0.04	56.48
May-99	0.93	86.08	0.02	56.51
Jun-99	1.25	87.33	0.07	56.58
Jul-99	0.92	88.25	0.12	56.69
Aug-99	1.38	89.64	0.12	56.82
Sep-99	2.00	91.64	0.04	56.86
Oct-99	1.86	93.50	0.00	56.86
Nov-99	1.71	95.21	0.03	56.88
Dec-99	1.41	96.62	0.03	56.91
Jan-00	1.37	97.99	0.00	56.92
Feb-00	1.29	99.27	0.00	56.92
Mar-00	1.22	100.50	0.00	56.92
Apr-00	1.12	101.60	0.00	56.92
May-00	0.96	102.60	0.00	56.92
Jun-00	1.17	103.70	0.00	56.92
Jul-00	1.18	104.90	0.00	56.92
Aug-00	0.98	105.90	0.00	56.92
Sep-00	1.03	106.90	0.00	56.92
Oct-00	0.92	107.90	0.00	56.92
Nov-00	0.84	108.70	0.00	56.92
Dec-00	0.80	109.50	0.00	56.92
Jan-01	0.70	110.20	0.00	56.92
Feb-01	0.79	111.00	0.00	56.92
Mar-01	0.90	111.90	0.00	56.92
Apr-01	0.60	112.50	0.00	56.92
May-01	0.49	113.00	0.00	56.92
Jun-01	0.60	113.60	0.00	56.92
Jul-01	0.74	114.30	0.00	56.92
Aug-01	0.63	114.90	0.00	56.92
Sep-01	0.53	115.50	0.00	56.92
Oct-01	0.54	116.00	0.00	56.92
Nov-01	0.45	116.50	0.00	56.92
Dec-01	0.42	116.90	0.00	56.92
Jan-02	0.38	117.30	0.00	56.92
Feb-02	0.32	117.60	0.00	56.92
Mar-02	0.40	118.00	0.00	56.92
Apr-02	0.40	118.40	0.00	56.92
May-02	0.38	118.80	0.00	56.92
Jun-02	0.36	119.10	0.00	56.92
Jul-02	0.39	119.50	0.00	56.92
Aug-02	0.40	119.90	0.00	56.92

**Table 7**  
**FS-12 Treatment System Mass Removal Summary**  
**FS-12 2009 Summary Letter Report**

Date	EDB Monthly Removal (lbs)	EDB Cumulative Removal (lbs)	Benzene Monthly Removal (lbs)	Benzene Cumulative Removal (lbs)
Sep-02	0.34	120.20	0.00	56.92
Oct-02	0.31	120.60	0.00	56.92
Nov-02	0.26	120.80	0.00	56.92
Dec-02	0.36	121.20	0.00	56.92
Jan-03	0.31	121.50	0.00	56.92
Feb-03	0.21	121.70	0.00	56.92
Mar-03	0.26	122.00	0.00	56.92
Apr-03	0.28	122.20	0.00	56.92
May-03	0.28	122.50	0.00	56.92
Jun-03	0.26	122.80	0.00	56.92
Jul-03	0.24	123.00	0.00	56.92
Aug-03	0.21	123.20	0.00	56.92
Sep-03	0.19	123.40	0.00	56.92
Oct-03	0.18	123.60	0.00	56.92
Nov-03	0.17	123.80	0.00	56.92
Dec-03	0.19	124.00	0.00	56.92
Jan-04	0.19	124.10	0.00	56.92
Feb-04	0.19	124.30	0.00	56.92
Mar-04	0.20	124.50	0.00	56.92
Apr-04	0.18	124.70	0.00	56.92
May-04	0.19	124.90	0.00	56.92
Jun-04	0.20	125.10	0.00	56.92
Jul-04	0.19	125.30	0.00	56.92
Aug-04	0.19	125.50	0.00	56.92
Sep-04	0.19	125.70	0.00	56.92
Oct-04	0.19	125.90	0.00	56.92
Nov-04	0.18	126.10	0.00	56.92
Dec-04	0.19	126.30	0.00	56.92
Jan-05	0.17	126.40	0.00	56.92
Feb-05	0.16	126.60	0.00	56.92
Mar-05	0.16	126.70	0.00	56.92
Apr-05	0.17	126.90	0.00	56.92
May-05	0.33	127.20	0.00	56.92
Jun-05	0.34	127.60	0.00	56.92
Jul-05	0.30	127.90	0.00	56.92
Aug-05	0.28	128.20	0.00	56.92
Sep-05	0.25	128.40	0.00	56.92
Oct-05	0.27	128.70	0.00	56.92
Nov-05	0.25	128.90	0.00	56.92
Dec-05	0.26	129.20	0.00	56.92
Jan-06	0.26	129.50	0.00	56.92
Feb-06	0.22	129.70	0.00	56.92
Mar-06	0.23	129.90	0.00	56.92
Apr-06	0.19	130.10	0.00	56.92
May-06	0.21	130.30	0.00	56.92
Jun-06	0.20	130.50	0.00	56.92
Jul-06	0.18	130.70	0.00	56.92
Aug-06	0.17	130.90	0.00	56.92
Sep-06	0.18	131.00	0.00	56.92
Oct-06	0.16	131.20	0.00	56.92
Nov-06	0.16	131.40	0.00	56.92
Dec-06	0.16	131.50	0.00	56.92
Jan-07	0.17	131.70	0.00	56.92
Feb-07	0.15	131.80	0.00	56.92
Mar-07	0.16	132.00	0.00	56.92
Apr-07	0.14	132.10	0.00	56.92
May-07	0.14	132.30	0.00	56.92

**Table 7**  
**FS-12 Treatment System Mass Removal Summary**  
**FS-12 2009 Summary Letter Report**

Date	EDB Monthly Removal (lbs)	EDB Cumulative Removal (lbs)	Benzene Monthly Removal (lbs)	Benzene Cumulative Removal (lbs)
Jun-07	0.13	132.40	0.00	56.92
Jul-07	0.12	132.50	0.00	56.92
Aug-07	0.12	132.70	0.00	56.92
Sep-07	0.11	132.80	0.00	56.92
Oct-07	0.11	132.90	0.00	56.92
Nov-07	0.09	133.00	0.00	56.92
Dec-07	0.11	133.10	0.00	56.92
Jan-08	0.09	133.20	0.00	56.92
Feb-08	0.09	133.30	0.00	56.92
Mar-08	0.09	133.40	0.00	56.92
Apr-08	0.10	133.50	0.00	56.92
May-08	0.09	133.50	0.00	56.92
Jun-08	0.09	133.60	0.00	56.92
Jul-08	0.07	133.70	0.00	56.92
Aug-08	0.07	133.80	0.00	56.92
Sep-08	0.06	133.80	0.00	56.92
Oct-08	0.08	133.90	0.00	56.92
Nov-08	0.07	134.00	0.00	56.92
Dec-08	0.07	134.10	0.00	56.92
Jan-09	0.07	134.10	0.00	56.92
Feb-09	0.06	134.20	0.00	56.92
Mar-09	0.07	134.30	0.00	56.92
Apr-09	0.06	134.30	0.00	56.92
May-09	0.06	134.40	0.00	56.92
Jun-09	0.05	134.50	0.00	56.92
Jul-09	0.06	134.50	0.00	56.92
Aug-09	0.06	134.60	0.00	56.92
Sep-09	0.05	134.60	0.00	56.92
Oct-09	0.05	134.70	0.00	56.92
Nov-09	0.05	134.70	0.00	56.92
Dec-09	0.04	134.80	0.00	56.92
<b>EDB removed (lbs) by ETR system during reporting period (January 2009 - December 2009)</b>				0.70
<b>Benzene removed (lbs) by ETR system during reporting period (January 2009 - December 2009)</b>				0.00
<b>Total EDB removed (lbs) since system startup (September 1997 - December 2009)</b>				134.80
<b>Total Benzene removed (lbs) since system startup (September 1997 - December 2009)</b>				56.92
<b>Total COCs removed (lbs) since system startup (September 1997 - December 2009)</b>				191.72

Data Source: AFCEE, March 2010, MMR-AFCEE Data Warehouse.

**Key:**

COC = contaminant of concern  
EDB = ethylene dibromide  
ETR = extraction, treatment, and reinjection  
lbs = pounds



**Table 8**  
**FS-12 Remedial System Electrical Consumption and Associated Air Emissions**  
**FS-12 2009 Summary Letter Report**

		1/1/2009 to 12/31/2009	System Startup (9/1997) to 12/31/2009
Volume of Groundwater Treated (million gallons)		182	4,082
Groundwater COC Mass Removal (pounds)		0.70	191.72
Electrical Usage (MWh)		946	19,317
Estimated Air Emissions <sup>1</sup> (based on electrical usage)	CO <sub>2</sub>	680	16,114
	NO <sub>x</sub>	1,285	24,430
	PM-10	63	843
	SO <sub>2</sub>	2,661	23,218
	VOCs	50	1,173
Estimated Reduction in Air Emissions due to Green Power Purchases <sup>2</sup>	CO <sub>2</sub>	117	189
	NO <sub>x</sub>	222	329
	PM-10	11	14
	SO <sub>2</sub>	461	548
	VOCs	9	14
Estimated Reduction in Air Emissions due to MMR Wind Turbine Operation <sup>3</sup>	CO <sub>2</sub>	11	11
	NO <sub>x</sub>	24	24
	PM-10	1.4	1.4
	SO <sub>2</sub>	64	64
	VOCs	0.8	0.8
Estimated Total Air Emissions with consideration of Green Power Purchases and MMR Wind Turbine Operation	CO <sub>2</sub>	552	15,914
	NO <sub>x</sub>	1,039	24,077
	PM-10	51	827
	SO <sub>2</sub>	2,136	22,606
	VOCs	40	1,158

Notes:

1) The estimated air emissions presented in this table are based on the assumption that until 4/30/2009, the power used to operate the MMR remedial systems was provided by the Canal Power Plant in Sandwich, MA. This power plant primarily produced electricity generated by the combustion of fuel oil and has been off-line since 5/1/2009. Starting on 5/1/2009, air emissions are based on electricity generated by the average mix of power sources in Massachusetts. Air emissions were calculated using MMR utility data from AFCEE's Metrix 4 Utility Accounting Software (<http://www.abraxasenergy.com/metrix4.php>) and emission factors obtained from the following websites:  
<http://www.csgnetwork.com/elecpowerpolcalc.html>  
<http://www.metrixcentral.com/EmissionsCalculator/Emissions%20Factors%202004.pdf>

2) Emissions offset by purchases of electricity from renewable sources beginning 7/1/2008.  
3) Emissions offset by operation of AFCEE-owned wind turbine beginning on 12/2/2009.

Key:

COC = contaminant of concern

CO<sub>2</sub> = carbon dioxide reported in tons

FS-12 = Fuel Spill-12

MMR = Massachusetts Military Reservation

MWh = megawatt hours

NO<sub>x</sub> = nitrogen oxides reported in pounds

PM-10 = particulate matter with a diameter of 10 micrometers or less reported in pounds

SO<sub>2</sub> = sulfur dioxide reported in pounds

VOCs = volatile organic compounds reported in pounds

**ATTACHMENT A**  
**Comparison of Detected Concentrations in FS-12 Groundwater  
and Treatment Plant Samples to Applicable Groundwater  
Standards**

**Attachment A**  
**Comparison of Detected Concentrations in FS-12 Groundwater and Treatment Plant Samples to Applicable Groundwater Standards**  
**FS-12 2009 Summary Letter Report**

Location Identification	Sample Date	Sample Elevation (ft msl)	Matrix	Test	Analyte	Analyte Result	DL	RL	Standard	Type	Standard Exceeded?
						All units - µg/L					
90EW0014	12/16/2009	-45.59	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.011	0.003	0.01	0.02	MMCL	No
90PLT01023	8/28/2009	0.00	WW	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.011	0.003	0.01	0.02	MMCL	No
90PLT01042	2/23/2009	0.00	WW	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.013	0.002	0.01	0.02	MMCL	No
90MW0027	5/21/2009	-28.86	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.015	0.002	0.01	0.02	MMCL	No
90PLT01023	9/25/2009	0.00	WW	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.016	0.003	0.01	0.02	MMCL	No
90MP0060B	12/28/2009	-69.00	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.017	0.003	0.01	0.02	MMCL	No
90MW0027	1/5/2009	-28.86	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.017	0.002	0.01	0.02	MMCL	No
90MW0027	12/18/2009	-28.86	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.017	0.003	0.01	0.02	MMCL	No
90DP0009	12/17/2009	-33.48	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.022	0.003	0.01	0.02	MMCL	Yes
90MW0106A	9/29/2009	-82.35	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.022	0.005	0.01	0.02	MMCL	Yes
90MP0060B	5/12/2009	-69.00	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.029	0.002	0.01	0.02	MMCL	Yes
90EW0015	12/16/2009	-45.34	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.033	0.003	0.01	0.02	MMCL	Yes
90EW0015	5/13/2009	-45.34	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.036	0.002	0.01	0.02	MMCL	Yes
90EW0018	12/16/2009	-42.78	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.05	0.003	0.01	0.02	MMCL	Yes
90MW0107A	5/20/2009	-55.70	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.053	0.002	0.01	0.02	MMCL	Yes
90EW0031	12/16/2009	-22.58	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.065	0.003	0.01	0.02	MMCL	Yes
90EW0031	5/13/2009	-22.58	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.067	0.002	0.01	0.02	MMCL	Yes
90EW0018	5/13/2009	-42.78	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.074	0.002	0.01	0.02	MMCL	Yes
90MW0202C	1/5/2009	-6.54	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.075	0.002	0.01	0.02	MMCL	Yes
90MW0202C	12/18/2009	-6.54	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.075	0.003	0.01	0.02	MMCL	Yes
90DP0006	12/17/2009	-32.56	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.101	0.003	0.01	0.02	MMCL	Yes
90MW0202C	5/7/2009	-6.54	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.122	0.002	0.01	0.02	MMCL	Yes
90MW0053	5/21/2009	-41.64	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.169	0.002	0.01	0.02	MMCL	Yes
90MW0020	5/21/2009	-11.00	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.17	0.002	0.01	0.02	MMCL	Yes
90DP0009	5/7/2009	-33.48	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.172	0.002	0.01	0.02	MMCL	Yes
90DP0006	5/20/2009	-32.56	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.175	0.002	0.01	0.02	MMCL	Yes
90EW0017	12/16/2009	-44.77	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.188	0.003	0.01	0.02	MMCL	Yes
90MW0107A	5/7/2009	-55.70	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.214	0.002	0.01	0.02	MMCL	Yes
90MW0106A	12/17/2009	-82.35	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.308	0.003	0.01	0.02	MMCL	Yes
90EW0025	12/16/2009	-45.84	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.316	0.003	0.01	0.02	MMCL	Yes
90EW0017	5/13/2009	-44.77	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.354	0.002	0.01	0.02	MMCL	Yes
90EW0025	5/13/2009	-45.84	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.357	0.002	0.01	0.02	MMCL	Yes
90PLT01001	9/25/2009	0.00	WW	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.358	0.003	0.01	0.02	MMCL	Yes
90MW0107A	12/17/2009	-55.70	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.374	0.003	0.01	0.02	MMCL	Yes
90PLT01001	12/30/2009	0.00	WW	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.374	0.003	0.01	0.02	MMCL	Yes
90PLT01001	6/24/2009	0.00	WW	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.378	0.003	0.01	0.02	MMCL	Yes
90EW0026	12/16/2009	-44.98	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.393	0.003	0.01	0.02	MMCL	Yes
90PLT01001	11/24/2009	0.00	WW	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.421	0.003	0.01	0.02	MMCL	Yes
90PLT01001	10/27/2009	0.00	WW	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.426	0.003	0.01	0.02	MMCL	Yes
90PLT01001	7/27/2009	0.00	WW	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.472	0.003	0.01	0.02	MMCL	Yes
90PLT01001	5/26/2009	0.00	WW	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.481	0.004	0.02	0.02	MMCL	Yes
90PLT01001	4/24/2009	0.00	WW	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.487	0.004	0.02	0.02	MMCL	Yes
90PLT01001	8/28/2009	0.00	WW	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.492	0.003	0.01	0.02	MMCL	Yes
90PLT01001	1/26/2009	0.00	WW	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.513	0.004	0.02	0.02	MMCL	Yes

**Attachment A**  
**Comparison of Detected Concentrations in FS-12 Groundwater and Treatment Plant Samples to Applicable Groundwater Standards**  
**FS-12 2009 Summary Letter Report**

Location Identification	Sample Date	Sample Elevation (ft msl)	Matrix	Test	Analyte	Analyte Result	DL	RL	Standard	Type	Standard Exceeded?
						All units - µg/L					
90PLT01001	3/25/2009	0.00	WW	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.529	0.004	0.02	0.02	MMCL	Yes
90PLT01001	2/23/2009	0.00	WW	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.537	0.004	0.02	0.02	MMCL	Yes
90EW0026	5/13/2009	-44.98	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.57	0.004	0.02	0.02	MMCL	Yes
90MW0106C	5/7/2009	-49.67	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.571	0.004	0.02	0.02	MMCL	Yes
90EW0019	12/16/2009	-52.92	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.677	0.003	0.01	0.02	MMCL	Yes
90MW0106A	5/7/2009	-82.35	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.705	0.01	0.05	0.02	MMCL	Yes
90DP1003	5/15/2009	-52.74	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	0.808	0.01	0.05	0.02	MMCL	Yes
90MW0106C	9/30/2009	-49.67	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	1.03	0.024	0.048	0.02	MMCL	Yes
90EW0019	5/13/2009	-52.92	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	1.09	0.01	0.05	0.02	MMCL	Yes
90MW0106C	12/17/2009	-49.67	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	1.2	0.015	0.05	0.02	MMCL	Yes
90MW0040	5/20/2009	-42.40	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	1.4	0.02	0.1	0.02	MMCL	Yes
90MW0200C	12/18/2009	-38.31	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	1.62	0.016	0.05	0.02	MMCL	Yes
90DP1003	12/29/2009	-52.74	WA	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	1.78	0.032	0.099	0.02	MMCL	Yes
90MW0200C	5/7/2009	-38.31	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	3.11	0.02	0.1	0.02	MMCL	Yes
90MW0106B	12/17/2009	-69.03	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	9.07	0.031	0.1	0.02	MMCL	Yes
90MW0106B	9/30/2009	-69.03	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	11	0.481	0.961	0.02	MMCL	Yes
90MW0106B	5/20/2009	-69.03	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	13.1	0.2	1	0.02	MMCL	Yes
90MW0201B	12/18/2009	-55.22	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	13.2	0.063	0.198	0.02	MMCL	Yes
90MW0201B	5/7/2009	-55.22	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	14.2	0.1	0.5	0.02	MMCL	Yes
90MW0106B	5/7/2009	-69.03	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	14.7	0.1	0.5	0.02	MMCL	Yes
90MW0201B	1/5/2009	-55.22	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	22.4	0.2	1	0.02	MMCL	Yes
90MW0055	5/20/2009	-70.65	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	23.1	0.2	1	0.02	MMCL	Yes
90DP0008	5/15/2009	-97.38	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	BRL	0.002	0.01	0.02	MMCL	No
90EW0014	5/13/2009	-45.59	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	BRL	0.002	0.01	0.02	MMCL	No
90MW0107B	5/7/2009	-41.34	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	BRL	0.002	0.01	0.02	MMCL	No
90MW0107B	12/17/2009	-41.34	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	BRL	0.003	0.01	0.02	MMCL	No
90MW0201C	1/5/2009	-35.07	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	BRL	0.002	0.01	0.02	MMCL	No
90MW0201C	5/7/2009	-35.07	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	BRL	0.002	0.01	0.02	MMCL	No
90MW0201C	12/18/2009	-35.07	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	BRL	0.003	0.01	0.02	MMCL	No
90PLT01001	2/23/2009	0.00	WW	SW8260B	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	BRL	0.14	1	0.02	MMCL	No
90PLT01001	5/26/2009	0.00	WW	SW8260B	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	BRL	0.14	1	0.02	MMCL	No
90PLT01001	8/28/2009	0.00	WW	SW8260B	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	BRL	0.2	1	0.02	MMCL	No
90PLT01001	11/24/2009	0.00	WW	SW8260B	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	BRL	0.19	1	0.02	MMCL	No
90PLT01033	2/23/2009	0.00	WW	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	BRL	0.002	0.01	0.02	MMCL	No
90PLT01033	3/25/2009	0.00	WW	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	BRL	0.002	0.01	0.02	MMCL	No
90PLT01033	4/24/2009	0.00	WW	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	BRL	0.002	0.01	0.02	MMCL	No
90PLT01033	5/26/2009	0.00	WW	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	BRL	0.002	0.01	0.02	MMCL	No
90PLT01033	10/27/2009	0.00	WW	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	BRL	0.003	0.01	0.02	MMCL	No
90PLT01042	1/26/2009	0.00	WW	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	BRL	0.002	0.01	0.02	MMCL	No
90PLT01053	5/26/2009	0.00	WW	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	BRL	0.002	0.01	0.02	MMCL	No
MW-242M2	5/22/2009	-11.12	WG	E504.1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	BRL	0.002	0.01	0.02	MMCL	No
96SV0004	5/18/2009	74.20	WG	SW8260B	BENZENE	1.1	0.15	1	5	MCL	No
90PLT01053	5/26/2009	0.00	WW	SW8260B	CHLOROFORM	1	0.14	1	70	ORSG	No
90PLT01053	8/28/2009	0.00	WW	SW8260B	CHLOROFORM	1.1	0.15	1	70	ORSG	No

**Attachment A**  
**Comparison of Detected Concentrations in FS-12 Groundwater and Treatment Plant Samples to Applicable Groundwater Standards**  
**FS-12 2009 Summary Letter Report**

Location Identification	Sample Date	Sample Elevation (ft msl)	Matrix	Test	Analyte	Analyte Result	DL	RL	Standard	Type	Standard Exceeded?
						All units - µg/L					
90PLT01053	11/24/2009	0.00	WW	SW8260B	CHLOROFORM	1.2	0.2	1	70	ORSG	No
90PLT01001	2/23/2009	0.00	WW	SW8260B	CHLOROFORM	BRL	0.14	1	70	ORSG	No
90PLT01001	5/26/2009	0.00	WW	SW8260B	CHLOROFORM	BRL	0.14	1	70	ORSG	No
90PLT01001	8/28/2009	0.00	WW	SW8260B	CHLOROFORM	BRL	0.15	1	70	ORSG	No
90PLT01001	11/24/2009	0.00	WW	SW8260B	CHLOROFORM	BRL	0.2	1	70	ORSG	No
90PLT01053	2/23/2009	0.00	WW	SW8260B	CHLOROFORM	BRL	0.14	1	70	ORSG	No
96SV0013	5/18/2009	71.90	WG	SW8260B	ETHYLBENZENE	75.5	0.65	5	700	MCL	No
96SV0004	5/18/2009	74.20	WG	SW8260B	ETHYLBENZENE	230	1.3	10	700	MCL	No
96SV0006	5/18/2009	69.70	WG	SW8260B	ETHYLBENZENE	303	0.65	5	700	MCL	No
96SV0013	5/18/2009	71.90	WG	SW8260B	M,P-XYLENE (SUM OF ISOMERS)	278	1.6	10	10,000	MCL	No
96SV0004	5/18/2009	74.20	WG	SW8260B	M,P-XYLENE (SUM OF ISOMERS)	748	3.1	20	10,000	MCL	No
96SV0006	5/18/2009	69.70	WG	SW8260B	M,P-XYLENE (SUM OF ISOMERS)	918	1.6	10	10,000	MCL	No
96SV0013	5/18/2009	71.90	WG	SW8260B	O-XYLENE (1,2-DIMETHYLBENZENE)	105	0.75	5	10,000	MCL	No
96SV0004	5/18/2009	74.20	WG	SW8260B	O-XYLENE (1,2-DIMETHYLBENZENE)	312	1.5	10	10,000	MCL	No
96SV0006	5/18/2009	69.70	WG	SW8260B	O-XYLENE (1,2-DIMETHYLBENZENE)	317	0.75	5	10,000	MCL	No
90PLT01001	6/19/2009	0.00	WW	SW6850	PERCHLORATE	BRL	0.04	0.2	2	MMCL	No
96SV0006	5/18/2009	69.70	WG	SW8260B	STYRENE	1.3	0.65	5	100	MCL	No
96SV0004	5/18/2009	74.20	WG	SW8260B	STYRENE	BRL	0.13	1	100	MCL	No
96SV0013	5/18/2009	71.90	WG	SW8260B	TOLUENE	3.1	0.75	5	1,000	MCL	No
96SV0006	5/18/2009	69.70	WG	SW8260B	TOLUENE	23.7	0.75	5	1,000	MCL	No
96SV0004	5/18/2009	74.20	WG	SW8260B	TOLUENE	41.7	0.15	1	1,000	MCL	No

Data Source: AFCEE, March 2010, MMR-AFCEE Data Warehouse

Notes:

1. MCLs and SMCLs from U.S. Environmental Protection Agency (EPA) web page, <http://www.epa.gov/safewater/contaminants/index.html>.
2. MMCLs and ORSGs from Massachusetts Department of Environmental Protection (MassDEP) web page, <http://www.mass.gov/dep/water/dwstand.pdf>.  
ORSG of 70 µg/L for chloroform is applicable to non-chlorinated water supplies only.
3. Total Xylenes: MCL and MMCL = 10,000 µg/L.

Key:

BRL = below reporting limit

DL = detection limit

EFF = treatment plant effluent

ft msl = feet mean sea level

INF = treatment plant influent

MID = treatment plant midpoint sample

MCL = Maximum Contaminant Level

MMCL = Massachusetts Maximum Contaminant Level

ORSG = Office of Research and Standards Guidance (MassDEP)

RL = reporting limit

WA = borehole screening sample

WG = groundwater sample

WW = plant water

µg/L = micrograms per liter

**ATTACHMENT B**  
**Boring Log - [90BH0001](#)**

**LOCATION: 90BH0001**
**FS-12 SPEIM**

Project Name: FS-12 SPEIM			Location: East side of Christie Hall; Camp Good News		
Project Number: 389849		Northing: 251446		Easting: 868927	
Drilling Contractor: Frontz Drilling/Dragin Drilling			Date Started: 9/30/2009		Date Finished: 10/06/2009
Drilling Equipment: Rig #534			Total Depth Drilled ft (BGS): 280		
Drilling Method: Sonication			Borehole Diameter (in.): 6		
Sampling Method: Core barrel			Logged By: J. Thies, M. Greenberg, R. Clennon		Reviewed By: CH2M HILL

Depth (ft-bgs)	Blow Counts Per 6 Inches	Sample Interval /Recovery	Driller's Comments and Sample ID	PID/FID	USCS Class	Lithologic Description and Associated Lithographic Symbol
65			Soil logging starts at 70 ft. bgs.			
70				15.0/ 20.0	•	SAND; 2.5Y 6/3 light yellowish brown, medium grained, little fine sand, trace coarse sand, trace rounded fine gravel, trace rounded cobble, trace silt, saturated.  No recovery.
75						
80			80.0 - 84.7 ft.: Lenses of some fine sand and trace to little coarse sand present throughout.	0.0/0.0	• • • • • • •	SAND; 2.5Y 6/3 light yellowish brown, medium grained, little fine sand, trace coarse sand, trace rounded fine gravel, trace silt, saturated.
85						No recovery.
90				15.0/ 12.9	• • • • • • •	SAND; 2.5Y 6/3 light yellowish brown, medium grained, little fine sand, trace coarse sand, trace rounded fine gravel, trace silt, saturated.

Project Name:FS-12 SPEIM					Location: East side of Christie Hall; Camp Good News		
Depth (ft-bgs)	Blow Counts Per 6 Inches	Sample Interval /Recovery	Driller's Comments  and Sample ID	PID/FID	USCS Class	Lithologic Description  and Associated Lithographic Symbol	
95			105.4 - 108.7 ft.: Unit fines downward. Fine sand lenses at 107.2 - 107.4 ft. bgs.	22.2/0.0		SAND; 2.5Y 6/3 light yellowish brown, medium grained, little fine sand, little rounded to subrounded fine to coarse gravel, trace coarse sand, trace silt, saturated.	
						SAND; 2.5Y 6/3 light yellowish brown, medium grained, little fine sand, trace coarse sand, trace rounded fine gravel, trace silt, saturated.	
						SAND; 2.5Y 6/3 light yellowish brown, fine grained, little medium sand, trace coarse sand, trace silt, saturated.	
100						SAND; 2.5Y 6/3 light yellowish brown, medium grained, little fine sand, trace coarse sand, trace rounded fine gravel, trace silt, saturated.	
						No recovery.	
				9.8/0.0		SAND; 2.5Y 6/3 light yellowish brown, medium grained, little fine sand, little silt, trace coarse sand, trace rounded fine gravel, saturated.	
105						SAND; 2.5Y 6/3 light yellowish brown, medium grained, little coarse sand, little fine sand, trace rounded fine gravel, trace silt, saturated.	
						SAND; 2.5Y 6/3 light yellowish brown, fine grained, little medium sand, trace coarse sand, trace silt, saturated.	
110						SAND; 2.5Y 6/3 light yellowish brown, medium grained, little coarse sand, little fine sand, trace rounded fine gravel, trace silt, saturated.	
						SAND; 2.5Y 6/3 light yellowish brown, medium grained, some fine sand, trace coarse sand, trace rounded to subrounded fine to coarse gravel, trace silt, saturated.	
115			120.0 - 125.4 ft.: Lenses of coarse sand throughout.	0.4/0.0		SAND; 2.5Y 6/3 light yellowish brown, medium grained, little coarse sand, little fine sand, little rounded to subrounded fine to coarse gravel, trace silt, saturated.	
120						SAND; 2.5Y 6/3 light yellowish brown, medium grained, little fine sand, trace coarse sand, trace silt, saturated.	
				3.5/0.0		SAND; 2.5Y 6/3 light yellowish brown, medium grained, little fine sand, trace coarse sand, trace fine to coarse rounded to subrounded gravel, trace silt, saturated.	
125						No recovery.	
130						SAND; 2.5Y 6/3 light yellowish brown, medium grained, little fine sand, trace coarse sand, trace fine rounded to subrounded gravel, trace silt, saturated.	
135							



Project Name:FS-12 SPEIM				Location: East side of Christie Hall; Camp Good News			
Depth (ft-bgs)	Blow Counts Per 6 Inches	Sample Interval /Recovery	Driller's Comments and Sample ID	PID/FID	USCS Class	Lithologic Description and Associated Lithographic Symbol	
140			142.1 - 148.3 ft.: Unit coarsens downward.	0.0/0.0			
						No recovery.	
145			150.0 - 153.3 ft.: Occurrence of gravel increases downward.	1.1/1.6		SAND; 2.5Y 6/4 light yellowish brown, fine to medium grained, trace coarse sand, trace silt, saturated.	
						SAND; 2.5Y 6/4 light yellowish brown, medium grained, little fine sand, trace to little coarse sand, trace fine rounded to subrounded gravel, trace silt, saturated.	
150						SAND; 2.5Y 6/4 light yellowish brown, medium to coarse grained, little fine sand, trace to little fine to coarse rounded to subrounded gravel, trace silt, saturated.	
						SAND; 2.5Y 6/4 light yellowish brown, medium grained, little fine sand, trace to little coarse sand, trace fine rounded to subrounded gravel, trace silt, saturated.	
155				0.0/0.0		SAND; 2.5Y 6/4 light yellowish brown, medium grained, little fine sand, trace coarse sand, trace fine to coarse rounded to subrounded gravel, trace silt, saturated.	
						No recovery.	
160						SAND; 2.5Y 6/3 light yellowish brown, fine to medium grained, trace coarse sand, trace to little fine to coarse rounded to subrounded gravel, trace silt, saturated.	
						SAND; 2.5Y 6/4 light yellowish brown, medium grained, little fine sand, trace coarse sand, trace fine to coarse subrounded gravel, trace silt, saturated.	
165				0.0/3.5		SAND; 2.5Y 6/4 light yellowish brown, medium grained, little fine sand, trace coarse sand, trace silt, saturated.	
						SAND; 2.5Y 6/4 light yellowish brown, medium grained, little coarse sand, little fine sand, little fine rounded gravel, trace silt, saturated.	
170							
175							

Project Name:FS-12 SPEIM					Location: East side of Christie Hall; Camp Good News		
Depth (ft-bgs)	Blow Counts Per 6 Inches	Sample Interval /Recovery	Driller's Comments and Sample ID	PID/FID	USCS Class	Lithologic Description and Associated Lithographic Symbol	
180			177.4 - 179.0 ft.: Gravel coarsens downward. 178.4 - 178.9 ft.: Very saturated zone.	0.0/0.0			
							SAND; 2.5Y 6/4 light yellowish brown, medium grained, some fine to coarse subrounded to subangular gravel, little fine sand, trace silt, saturated.
							SAND; 2.5Y 6/4 light yellowish brown, medium grained, little coarse sand, little fine sand, little fine rounded gravel, trace silt, saturated.
							SAND; 2.5Y 6/4 light yellowish brown, fine to medium grained, little silt, little clay, trace coarse sand, trace fine to coarse subrounded to subangular gravel, saturated.
185							SAND; 2.5Y 6/3 light yellowish brown, medium grained, little fine sand, trace to little silt, trace coarse sand, trace fine to coarse rounded to subrounded gravel, saturated.
							SAND; 2.5Y 7/4 pale yellow, fine grained, trace to little silt, trace medium sand, trace light gray lamination, saturated.
							No recovery.
190				0.1/1.2			SAND; 2.5Y 7/4 pale yellow, fine grained, trace to little silt, trace medium sand, trace light gray lamination, saturated.
							SAND; 2.5Y 7/4 pale yellow, medium grained, little fine sand, trace to little coarse sand, trace fine subrounded to subangular gravel, trace silt, saturated.
195							
200				0.3/0.0			No recovery.
							SAND; 2.5Y 6/3 light yellowish brown, medium grained, little fine sand, trace coarse sand, trace to little fine to coarse subrounded to subangular gravel, trace clay stringers, trace silt, saturated.
							SAND; 10YR 5/6 yellowish brown, medium grained, little fine sand, trace coarse sand, trace to little fine to coarse subrounded to subangular gravel, trace clay stringers, trace silt, saturated.
							SAND; 2.5Y 6/1 gray, fine to medium grained, little silt, trace to little coarse sand, trace to little fine to coarse rounded to subangular gravel, saturated.
205			204.0 - 206.0 ft.: Intermittent silt stringers throughout.				SAND; 2.5Y 6/4 light yellowish brown, fine to medium grained, trace to little silt, trace fine to coarse subrounded gravel, trace clay stringers, saturated.
							SAND; 2.5Y 6/3 light yellowish brown, fine grained, trace to little silt, trace mica, saturated.
							SAND; 2.5Y 6/3 light yellowish brown, fine grained, trace to little silt, trace mica, saturated.
210				2.0/1.6			
215							

Project Name:FS-12 SPEIM					Location: East side of Christie Hall; Camp Good News		
Depth (ft-bgs)	Blow Counts Per 6 Inches	Sample Interval /Recovery	Driller's Comments and Sample ID	PID/FID	USCS Class	Lithologic Description and Associated Lithographic Symbol	
220			220.0 - 229.3 ft.: Overall silt content increasing toward bottom.	0.0/0.1			SAND; 2.5Y 5/1 gray, fine grained, little silt, trace mica, saturated.
225							
230			231.7 - 236.8 ft.: Fine sand lenses (up to 1/2" thick) throughout. Becoming drier downward.	0.0/0.0			SAND; 2.5Y 5/1 gray, fine grained, little to some silt, trace mica, moist to wet. No recovery.
235							SAND; 2.5Y 5/1 gray, fine grained, little to some silt, trace mica, moist to wet. SAND; 2.5Y 5/1 gray, medium grained, some fine sand, trace fine to coarse rounded to subrounded gravel, trace silt, saturated. SILT; 2.5Y 5/1 gray, trace to little fine sand, trace clay, moist to wet.
240			240.0 - 243.4 ft.: Gravel content increasing downward. Unit coarsens downward.	6.8/7.4			SAND; 2.5Y 7/1 light gray, fine grained, trace medium sand, trace fine rounded gravel, trace silt, trace silt stringers, saturated. SAND; 2.5Y 5/1 gray, fine grained, little silt, saturated. SILT; 2.5Y 4/1 dark gray, trace to little clay, trace fine sand lenses, moist. SAND; 2.5Y 5/1 gray, fine grained, trace to little silt, trace fine rounded gravel, trace silty clay stringers, saturated.
245			243.9 - 250.0 ft.: 248 ft.: 3.2" cobble. Gravel content increases downward.				SAND; 2.5Y 5/2 grayish brown, medium grained, little fine sand, little coarse sand, trace to little fine to coarse subrounded to subangular gravel, trace silt, trace silty clay stringers, saturated. SAND; 2.5Y 5/2 grayish brown, fine to medium grained, trace coarse sand, trace silt, saturated. SAND; 2.5Y 7/2 light gray, medium grained, little fine sand, trace coarse sand, trace fine to coarse subrounded to subangular gravel, trace cobble, trace silt, saturated.
250				1.5/0.0			SAND; 2.5Y 6/4 light yellowish brown, medium grained, little fine sand, trace to little fine to cobble-sized subrounded to subangular gravel, trace to little coarse sand, trace silt, saturated.
255			252.9 - 259.0 ft.: Gravel content and size increasing with depth.				SAND; 2.5Y 6/4 light yellowish brown, medium grained, little fine sand, trace coarse sand, trace fine to coarse subrounded to subangular gravel, trace silt, saturated.

Project Name:FS-12 SPEIM				Location: East side of Christie Hall; Camp Good News			
Depth (ft-bgs)	Blow Counts Per 6 Inches	Sample Interval /Recovery	Driller's Comments and Sample ID	PID/FID	USCS Class	Lithologic Description and Associated Lithographic Symbol	
260			260.0 - 274.5 ft.: Alternating lenses/zones of fine sand, medium sand, and gravelly sand throughout unit.	0.2/0.0			
							SAND; 2.5Y 6/4 light yellowish brown, fine grained, trace silt, saturated.
							No recovery.
							SAND; 5Y 6/2 light olive gray, fine to medium grained, trace to little coarse sand, trace to little fine to coarse subrounded to angular gravel, trace cobble, trace silt, saturated.
265							
270							
275							
							SAND; 2.5Y 6/1 gray, fine grained, trace medium sand, trace coarse sand, trace silt, trace fine subrounded to subangular gravel, saturated.
							SILTY SAND; 2.5Y 6/1 gray, fine grained, little to some fine to coarse subangular to angular gravel, little cobble, trace coarse sand, trace medium sand, trace clay, saturated.
280							Bottom of boring @ 280 ft. bgs. Core barrel refusal on bedrock.

**ATTACHMENT C**  
**FS-12 2009 SLR**  
**Data Summary Reports**

**ATTACHMENT C-1**

**Data Summary Report for Data Collected Under AFCEE 4P08 Task Orders  
(January 2009 through December 2009)**

**ATTACHMENT C-2**

**Data Summary Report for Data Collected Under AFCEE ECOS Task Order  
(June 2009 through December 2009)**

## **ATTACHMENT C-1**

### **Data Summary Report for Data Collected Under AFCEE 4P08 Task Orders**

**(January 2009 through December 2009)**

**Attachment C-1**  
**Data Summary Report**  
**FS-12 2009 Summary Letter Report**

## **INTRODUCTION**

The objective of this data summary report (DSR) is to assess the data quality of analytical results for samples collected for the Fuel Spill-12 System Performance and Ecological Impact Monitoring (SPEIM) Program at the Massachusetts Military Reservation (MMR) as presented in the *Fuel Spill-12 Summary Letter Report*. This report is intended as a general data quality assessment designed to summarize data issues.

## **ANALYTICAL DATA**

This DSR covers 65 groundwater samples with one field duplicate sample, two surface water samples with one field duplicate sample, and 25 plant samples. Field duplicates are not required for treatment facility plant samples. These samples were reported under 15 sample delivery groups. Samples were collected between 26 January 2009 and 30 September 2009. The analyses were performed by and Groundwater Analytical Laboratory (GWAM) at MMR and Analytics Environmental Laboratory LLC (ANAP) in Portsmouth, New Hampshire. Samples were collected and hand-delivered, to GWAM and shipped overnight to ANAP for analysis. Samples were analyzed for one or more of the analytes/methods provided in Table C1-1.

**Table C1-1**  
**Analytical Parameter**

<b>Parameter</b>	<b>Method</b>	<b>Laboratory</b>
1,2-Dibromoethane (Ethylene Dibromide)	E504.1	GWAM, ANAP
Volatile Organic Compounds in water and soil	SW8260B	GWAM

E = Environmental Protection Agency (EPA) Method

SW = SW 846 Test Methods for Evaluating Solid Waste, 3rd Edition, Revision 4, 1996

The data were assessed using the MMR SPEIM Quality Assurance Project Plan (QAPP)<sup>1</sup>.

The assessment included a review of the following:

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<sup>1</sup> AFCEE. 2009 (December). *Quality Assurance Project Plan for the MMR SPEIM/LTM/O&M Program*. 389849-Program-Multiple-QAPP-001. Prepared by CH2M HILL for AFCEE/MMR Installation Restoration Program, Otis Air National Guard Base, MA.

- Chain-of-Custody documentation
- Holding time compliance
- Required quality control (QC) samples at the specified frequencies
- Method blanks
- Laboratory control spiking samples
- Surrogate spike recoveries
- Internal standards
- Initial and continuing calibration information and other method-specific criteria as defined by the SPEIM QAPP

Field samples were reviewed to ascertain field compliance and data quality issues. This included a review of trip blanks, equipment blanks, and field duplicates.

Definitive data generated prior to July 2004, were carried through a Tier II data validation as defined by the SPEIM QAPP. In July 2004, an automated validation approach as described in the SPEIM QAPP was implemented for samples analyzed using methods SW8260B and E504.1 received from GWAM, the onsite laboratory at MMR. When using the automated approach, the Validation Data Management System software automatically imported, validated, and created an exceedance report that was reviewed by the project chemist. The automated system reviewed all the same QC elements as the semi-automated review process with the exception of the tune criteria, internal standard recoveries and initial and continuing calibration criteria. The same flagging criteria were used for both processes.

To provide additional confidence in the automated process for these two methods, data were compared to historical results, as described in the SPEIM QAPP. They were reviewed for outlying quantitative data that might suggest a data quality issue that could affect data usability. This report was also reviewed by the project chemist. When new data appeared to be inconsistent with historical data, the automated process was superseded by manually performing a Tier II validation to resolve the identified inconsistencies. Sample locations that had insufficient historical data were validated



using the Tier II process defined in the SPEIM QAPP until sufficient data were collected to allow use of the automated system (minimum of three data points).

Method E504.1 data received from ANAP was carried through a Tier II data validation.

Data flags were assigned according to the SPEIM QAPP. These flags, and the reason for each flag, were entered into the electronic database. Multiple flags are routinely applied to specific sample method/matrix/analyte combinations, but there is only one final flag. A final flag is applied to the data, and is the most conservative of the applied validation flags. The final flag also includes matrix and blank sample impacts.

The data flags are listed in the SPEIM QAPP and are defined as follows:

- J = Analyte was present but the reported value may not be accurate or precise (estimated).
- R = Analyte result was unusable due to deficiencies in the ability to analyze the sample and meet QC criteria.
- U = Analyte was not detected at the specified detection limit.
- UJ = Analyte was not detected and the specified detection limit may not be accurate or precise (estimated).

## **FINDINGS**

The summaries of the data validation findings are contained in the following subsections.

### **Holding Times**

All holding-time criteria were met.

### **Calibration**

Initial and continuing calibrations were analyzed as required in every analytical batch and were in control for the Tier II validated data. No calibration flags were applied.

## **Method Blanks**

Method blanks were analyzed at the required frequency for each method. No method blank flags were applied.

## **Field Blanks**

Trip blanks and equipment blanks were collected and analyzed at the required frequency. No field blank flags were applied.

## **Field Duplicates**

Field duplicates were collected as required, and precision was acceptable. No field duplicate flags were applied.

## **Matrix Spike Samples**

Matrix spike/matrix spike duplicates were not required for routine sample locations.<sup>2</sup>

## **Surrogates**

Surrogate recoveries met each method SPEIM QAPP criteria overall. No surrogate flags were applied.

## **Laboratory Control Samples**

Laboratory control sample/laboratory control sample duplicates (LCS/LCSD) were analyzed as required and in control. No LCS flags were applied.

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<sup>2</sup> AFCEE. 2004 (October). *SPEIM and LTM Monitoring Reduction in FD and MS/MSD Sampling*. 187615-SPEIM-Multiple-PRJNOT-003. Prepared by CH2M HILL for AFCEE/MMR Installation Restoration Program, Otis Air National Guard Base, MA.

## **Confirmation Results**

Confirmation samples were analyzed as required by method E504.1. No confirmation flags were applied.

## **Internal Standards**

Internal standards were in control for Tier II validated data. No internal standard flags were applied.

## **Chain of Custody**

No chain of custody anomalies were noted in the review.

## **Overall Assessment**

The goal of this assessment is to demonstrate that a sufficient number of representative samples were collected and the resulting analytical data can be used to support the decision-making process. The procedures for assessing the precision, accuracy, representativeness, completeness, and comparability parameters (PARCC) are addressed in the SPEIM QAPP. The following summary highlights the PARCC findings for the above-defined events:

1. The completeness goal for valid usable data is 95 percent for aqueous samples. Completeness for aqueous samples was 100 percent and the completeness goal was met for all compounds.
2. The routinely acceptable performance of field and laboratory QC indicators (field duplicates, field blanks, laboratory blanks, surrogate spikes, LCS/LCSD, and calibrations) shows that the precision and accuracy of the data met project objectives.
3. Sample results are representative and comparable to field conditions and past historical data because the field sampling and laboratory analyses were performed using standardized and documented procedures as defined in project documents. In addition, all results were reported with industry standard units.

**Attachment C-1**  
**Analytical Laboratory Results, January - September 2009**  
**FS-12 2009 Summary Letter Report**

Location	Sample ID	Date	Test	Type	Analyte	Matrix	Depth	Analyte Result	DL	RL	Units	Qual
90DP0003	CHPD00222-A0109DIF	5/7/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	211	ND	0.002	0.01	µg/L	U
90DP0006	CHPD00223-A0109	5/20/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	157.4	0.175	0.002	0.01	µg/L	
90DP0008	CHPD00224-A0109	5/15/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	210	BRL	0.002	0.01	µg/L	J
90DP0009	CHPD00225-A0109DIF	5/7/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	155	0.172	0.002	0.01	µg/L	
90DP0012A	CHPD00226-A0109	5/15/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	194.2	ND	0.002	0.01	µg/L	U
90DP1003	CHPD00227-R0109	5/15/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	155.6	0.808	0.01	0.05	µg/L	
90EW0014	CHPD00229-A0109	5/13/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	196.8	BRL	0.002	0.01	µg/L	J
90EW0014	CHPD10229-A0109	5/13/2009	E504.1	FD1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	196.8	BRL	0.002	0.01	µg/L	J
90EW0015	CHPD00230-A0109	5/13/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	198.1	0.036	0.002	0.01	µg/L	
90EW0017	CHPD00232-A0109	5/13/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	195.8	0.354	0.002	0.01	µg/L	
90EW0018	CHPD00233-A0109	5/13/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	182.27	0.074	0.002	0.01	µg/L	
90EW0019	CHPD00234-A0109	5/13/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	197.85	1.09	0.01	0.05	µg/L	
90EW0024	CHPD00238-A0109	5/20/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	159.8	ND	0.002	0.01	µg/L	U
90EW0025	CHPD00239-A0109	5/13/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	193.74	0.357	0.002	0.01	µg/L	
90EW0026	CHPD00240-A0109	5/13/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	194.9	0.57	0.004	0.02	µg/L	
90EW0027	CHPD00241-A0109	5/13/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	175.6	ND	0.002	0.01	µg/L	U
90EW0031	CHPD00242-A0109	5/13/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	106.53	0.067	0.002	0.01	µg/L	
90MP0060A	CHPD00243-A0109	5/12/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	171.77	ND	0.002	0.01	µg/L	U
90MP0060B	CHPD00244-A0109	5/12/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	152.27	0.029	0.002	0.01	µg/L	
90MP0060C	CHPD00245-A0109	5/12/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	127.77	ND	0.002	0.01	µg/L	U
90MW0007	CHPD00246-A0109DIF	5/21/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	181.5	ND	0.002	0.01	µg/L	U
90MW0015	CHPD00247-A0109DIF	5/21/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	99	ND	0.002	0.01	µg/L	U
90MW0020	CHPD00248-A0109DIF	5/21/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	151	0.17	0.002	0.01	µg/L	
90MW0027	CHPD00263-A0109DIF	5/21/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	165.63	0.015	0.002	0.01	µg/L	
90MW0040	CHPD00264-A0109	5/20/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	190.09	1.4	0.02	0.1	µg/L	
90MW0047	CHPD00265-A0109DIF	5/21/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	186.85	ND	0.002	0.01	µg/L	U
90MW0050	CHPD00266-A0109DIF	5/21/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	88.2	ND	0.002	0.01	µg/L	U
90MW0053	CHPD00267-A0109DIF	5/21/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	191.67	0.169	0.002	0.01	µg/L	
90MW0055	CHPD00268-A0109	5/20/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	221.5	23.1	0.2	1	µg/L	
90MW0056	CHPD00269-A0109DIF	5/21/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	215.5	ND	0.002	0.01	µg/L	U
90MW0064	CHPD00270-A0109DIF	5/21/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	207.5	ND	0.002	0.01	µg/L	U
90MW0066	CHPD00271-A0109DIF	5/21/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	191	ND	0.002	0.01	µg/L	U
90MW0066A	CHPD00272-A0109DIF	5/21/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	142	ND	0.002	0.01	µg/L	U
90MW0076	CHPD00273-A0109	5/20/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	157	ND	0.002	0.01	µg/L	U
90MW0077	CHPD00274-A0109DIF	5/21/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	150.5	ND	0.002	0.01	µg/L	U
90MW0078	CHPD00275-A0109DIF	5/21/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	149.5	ND	0.002	0.01	µg/L	U
90MW0079B	CHPD00276-A0109DIF	5/21/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	188.5	ND	0.002	0.01	µg/L	U
90MW0079C	CHPD00277-A0109DIF	5/21/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	222.5	ND	0.002	0.01	µg/L	U
90MW0084A	CHPD00278-A0109DIF	5/21/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	162.5	ND	0.002	0.01	µg/L	U
90MW0100A	CHPD00279-A0109DIF	5/21/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	157.41	ND	0.002	0.01	µg/L	U
90MW0100B	CHPD00280-A0109DIF	5/21/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	102.32	ND	0.002	0.01	µg/L	U
90MW0103A	CHPD00281-A0109 DIF	5/21/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	117.5	ND	0.003	0.01	µg/L	U
90MW0103A	CHPD00281-A0109DIF	5/21/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	117.5	ND	0.002	0.01	µg/L	U
90MW0106A	CHPD00288-A0109DIF	5/7/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	224.92	0.705	0.01	0.05	µg/L	
90MW0106B	CHPD00289-A0109DIF	5/7/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	212.33	14.7	0.1	0.5	µg/L	
90MW0106B	CHPD00289-R0109	5/20/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	212.33	13.1	0.2	1	µg/L	
90MW0106C	CHPD00290-A0109DIF	5/7/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	192.24	0.571	0.004	0.02	µg/L	

**Attachment C-1**  
**Analytical Laboratory Results, January - September 2009**  
**FS-12 2009 Summary Letter Report**

Location	Sample ID	Date	Test	Type	Analyte	Matrix	Depth	Analyte Result	DL	RL	Units	Qual
90MW0106D	CHPD00291-A0109DIF	5/20/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	177.5	ND	0.002	0.01	µg/L	U
90MW0107A	CHPD00292-A0109DIF	5/7/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	206.9	0.214	0.002	0.01	µg/L	
90MW0107A	CHPD00292-R0109	5/20/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	206.9	0.053	0.002	0.01	µg/L	
90MW0107B	CHPD00293-A0109DIF	5/7/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	192.68	BRL	0.002	0.01	µg/L	J
90MW0200B	CHPD00302-A0109DIF	5/7/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	234.59	ND	0.002	0.01	µg/L	U
90MW0200C	CHPD00303-A0109DIF	5/7/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	187.55	3.11	0.02	0.1	µg/L	
90MW0201A	CHPD00304-A0109DIF	5/20/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	257.69	ND	0.002	0.01	µg/L	U
90MW0201B	CHPD00305-A0109DIF	5/7/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	202.69	14.2	0.1	0.5	µg/L	
90MW0201C	CHPD00306-A0109DIF	5/7/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	182.54	BRL	0.002	0.01	µg/L	J
90MW0202B	CHPD00339-A0109DIF	5/20/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	212.6	ND	0.002	0.01	µg/L	U
90MW0202C	CHPD00340-A0109DIF	5/7/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	142.54	0.122	0.002	0.01	µg/L	
90PLT01001	CHTB01001-M0209	1/26/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		0.513	0.004	0.02	µg/L	
90PLT01001	CHTB01001-M0309	2/23/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		0.537	0.004	0.02	µg/L	
90PLT01001	CHTB01001-M0309	2/23/2009	SW8260B	N1	1,1,1-TRICHLOROETHANE	WW		ND	0.21	1	µg/L	U
90PLT01001	CHTB01001-M0309	2/23/2009	SW8260B	N1	1,1,2,2-TETRACHLOROETHANE	WW		ND	0.13	1	µg/L	U
90PLT01001	CHTB01001-M0309	2/23/2009	SW8260B	N1	1,1,2-TRICHLOROETHANE	WW		ND	0.13	1	µg/L	U
90PLT01001	CHTB01001-M0309	2/23/2009	SW8260B	N1	1,1-DICHLOROETHANE	WW		ND	0.17	1	µg/L	U
90PLT01001	CHTB01001-M0309	2/23/2009	SW8260B	N1	1,1-DICHLOROETHENE	WW		ND	0.19	1	µg/L	U
90PLT01001	CHTB01001-M0309	2/23/2009	SW8260B	N1	1,2,4-TRICHLOROETHANE	WW		ND	0.18	1	µg/L	U
90PLT01001	CHTB01001-M0309	2/23/2009	SW8260B	N1	1,2-DIBROMO-3-CHLOROPROPANE	WW		ND	0.2	2	µg/L	U
90PLT01001	CHTB01001-M0309	2/23/2009	SW8260B	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		BRL	0.14	1	µg/L	J
90PLT01001	CHTB01001-M0309	2/23/2009	SW8260B	N1	1,2-DICHLOROBENZENE	WW		ND	0.16	1	µg/L	U
90PLT01001	CHTB01001-M0309	2/23/2009	SW8260B	N1	1,2-DICHLOROETHANE	WW		ND	0.13	1	µg/L	U
90PLT01001	CHTB01001-M0309	2/23/2009	SW8260B	N1	1,2-DICHLOROPROPANE	WW		ND	0.13	1	µg/L	U
90PLT01001	CHTB01001-M0309	2/23/2009	SW8260B	N1	1,3-DICHLOROBENZENE	WW		ND	0.13	1	µg/L	U
90PLT01001	CHTB01001-M0309	2/23/2009	SW8260B	N1	1,4-DICHLOROBENZENE	WW		ND	0.14	1	µg/L	U
90PLT01001	CHTB01001-M0309	2/23/2009	SW8260B	N1	BENZENE	WW		ND	0.15	1	µg/L	U
90PLT01001	CHTB01001-M0309	2/23/2009	SW8260B	N1	BROMOCHLOROMETHANE	WW		ND	0.11	1	µg/L	U
90PLT01001	CHTB01001-M0309	2/23/2009	SW8260B	N1	BROMODICHLOROMETHANE	WW		ND	0.14	1	µg/L	U
90PLT01001	CHTB01001-M0309	2/23/2009	SW8260B	N1	BROMOFORM	WW		ND	0.12	1	µg/L	U
90PLT01001	CHTB01001-M0309	2/23/2009	SW8260B	N1	BROMOMETHANE	WW		ND	0.22	2	µg/L	U
90PLT01001	CHTB01001-M0309	2/23/2009	SW8260B	N1	CARBON TETRACHLORIDE	WW		ND	0.17	1	µg/L	U
90PLT01001	CHTB01001-M0309	2/23/2009	SW8260B	N1	CHLOROBENZENE	WW		ND	0.16	1	µg/L	U
90PLT01001	CHTB01001-M0309	2/23/2009	SW8260B	N1	CHLOROETHANE	WW		ND	0.23	1	µg/L	U
90PLT01001	CHTB01001-M0309	2/23/2009	SW8260B	N1	CHLOROFORM	WW		BRL	0.14	1	µg/L	J
90PLT01001	CHTB01001-M0309	2/23/2009	SW8260B	N1	CHLOROMETHANE	WW		ND	0.23	1	µg/L	U
90PLT01001	CHTB01001-M0309	2/23/2009	SW8260B	N1	DIBROMOCHLOROMETHANE	WW		ND	0.08	1	µg/L	U
90PLT01001	CHTB01001-M0309	2/23/2009	SW8260B	N1	ETHYLBENZENE	WW		ND	0.13	1	µg/L	U
90PLT01001	CHTB01001-M0309	2/23/2009	SW8260B	N1	M,P-XYLENE (SUM OF ISOMERS)	WW		ND	0.31	2	µg/L	U
90PLT01001	CHTB01001-M0309	2/23/2009	SW8260B	N1	METHYLENE CHLORIDE	WW		ND	0.19	2	µg/L	U
90PLT01001	CHTB01001-M0309	2/23/2009	SW8260B	N1	O-XYLENE (1,2-DIMETHYLBENZENE)	WW		ND	0.15	1	µg/L	U
90PLT01001	CHTB01001-M0309	2/23/2009	SW8260B	N1	STYRENE	WW		ND	0.13	1	µg/L	U
90PLT01001	CHTB01001-M0309	2/23/2009	SW8260B	N1	TETRACHLOROETHENE (PCE)	WW		ND	0.18	1	µg/L	U
90PLT01001	CHTB01001-M0309	2/23/2009	SW8260B	N1	TOLUENE	WW		ND	0.15	1	µg/L	U
90PLT01001	CHTB01001-M0309	2/23/2009	SW8260B	N1	TRICHLOROETHENE (TCE)	WW		ND	0.15	1	µg/L	U
90PLT01001	CHTB01001-M0309	2/23/2009	SW8260B	N1	VINYL CHLORIDE	WW		ND	0.2	1	µg/L	U
90PLT01001	CHTB01001-M0309	2/23/2009	SW8260B	N1	cis-1,2-DICHLOROETHENE	WW		ND	0.19	1	µg/L	U

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Location	Sample ID	Date	Test	Type	Analyte	Matrix	Depth	Analyte Result	DL	RL	Units	Qual
90PLT01001	CHTB01001-M0309	2/23/2009	SW8260B	N1	cis-1,3-DICHLOROPROPENE	WW		ND	0.13	1	µg/L	U
90PLT01001	CHTB01001-M0309	2/23/2009	SW8260B	N1	tert-BUTYL METHYL ETHER	WW		ND	0.12	1	µg/L	U
90PLT01001	CHTB01001-M0309	2/23/2009	SW8260B	N1	trans-1,2-DICHLOROETHENE	WW		ND	0.22	1	µg/L	U
90PLT01001	CHTB01001-M0309	2/23/2009	SW8260B	N1	trans-1,3-DICHLOROPROPENE	WW		ND	0.08	1	µg/L	U
90PLT01001	CHTB01001-M0409	3/25/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		0.529	0.004	0.02	µg/L	
90PLT01001	CHTB01001-M0509	4/24/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		0.487	0.004	0.02	µg/L	
90PLT01001	CHTB01001-M0609	5/26/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		0.481	0.004	0.02	µg/L	
90PLT01001	CHTB01001-M0609	5/26/2009	SW8260B	N1	1,1,1-TRICHLOROETHANE	WW		ND	0.21	1	µg/L	U
90PLT01001	CHTB01001-M0609	5/26/2009	SW8260B	N1	1,1,2,2-TETRACHLOROETHANE	WW		ND	0.13	1	µg/L	U
90PLT01001	CHTB01001-M0609	5/26/2009	SW8260B	N1	1,1,2-TRICHLOROETHANE	WW		ND	0.13	1	µg/L	U
90PLT01001	CHTB01001-M0609	5/26/2009	SW8260B	N1	1,1-DICHLOROETHANE	WW		ND	0.17	1	µg/L	U
90PLT01001	CHTB01001-M0609	5/26/2009	SW8260B	N1	1,1-DICHLOROETHENE	WW		ND	0.19	1	µg/L	U
90PLT01001	CHTB01001-M0609	5/26/2009	SW8260B	N1	1,2,4-TRICHLOROBENZENE	WW		ND	0.18	1	µg/L	U
90PLT01001	CHTB01001-M0609	5/26/2009	SW8260B	N1	1,2-DIBROMO-3-CHLOROPROPANE	WW		ND	0.13	2	µg/L	U
90PLT01001	CHTB01001-M0609	5/26/2009	SW8260B	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		BRL	0.14	1	µg/L	J
90PLT01001	CHTB01001-M0609	5/26/2009	SW8260B	N1	1,2-DICHLOROBENZENE	WW		ND	0.16	1	µg/L	U
90PLT01001	CHTB01001-M0609	5/26/2009	SW8260B	N1	1,2-DICHLOROETHANE	WW		ND	0.13	1	µg/L	U
90PLT01001	CHTB01001-M0609	5/26/2009	SW8260B	N1	1,2-DICHLOROPROPANE	WW		ND	0.13	1	µg/L	U
90PLT01001	CHTB01001-M0609	5/26/2009	SW8260B	N1	1,3-DICHLOROBENZENE	WW		ND	0.13	1	µg/L	U
90PLT01001	CHTB01001-M0609	5/26/2009	SW8260B	N1	1,4-DICHLOROBENZENE	WW		ND	0.14	1	µg/L	U
90PLT01001	CHTB01001-M0609	5/26/2009	SW8260B	N1	BENZENE	WW		ND	0.15	1	µg/L	U
90PLT01001	CHTB01001-M0609	5/26/2009	SW8260B	N1	BROMOCHLOROMETHANE	WW		ND	0.12	1	µg/L	U
90PLT01001	CHTB01001-M0609	5/26/2009	SW8260B	N1	BROMODICHLOROMETHANE	WW		ND	0.14	1	µg/L	U
90PLT01001	CHTB01001-M0609	5/26/2009	SW8260B	N1	BROMOFORM	WW		ND	0.12	1	µg/L	U
90PLT01001	CHTB01001-M0609	5/26/2009	SW8260B	N1	BROMOMETHANE	WW		ND	0.22	2	µg/L	U
90PLT01001	CHTB01001-M0609	5/26/2009	SW8260B	N1	CARBON TETRACHLORIDE	WW		ND	0.17	1	µg/L	U
90PLT01001	CHTB01001-M0609	5/26/2009	SW8260B	N1	CHLOROBENZENE	WW		ND	0.16	1	µg/L	U
90PLT01001	CHTB01001-M0609	5/26/2009	SW8260B	N1	CHLOROETHANE	WW		ND	0.23	1	µg/L	U
90PLT01001	CHTB01001-M0609	5/26/2009	SW8260B	N1	CHLOROFORM	WW		BRL	0.14	1	µg/L	J
90PLT01001	CHTB01001-M0609	5/26/2009	SW8260B	N1	CHLOROMETHANE	WW		ND	0.23	1	µg/L	U
90PLT01001	CHTB01001-M0609	5/26/2009	SW8260B	N1	DIBROMOCHLOROMETHANE	WW		ND	0.08	1	µg/L	U
90PLT01001	CHTB01001-M0609	5/26/2009	SW8260B	N1	ETHYLBENZENE	WW		ND	0.13	1	µg/L	U
90PLT01001	CHTB01001-M0609	5/26/2009	SW8260B	N1	M,P-XYLENE (SUM OF ISOMERS)	WW		ND	0.31	2	µg/L	U
90PLT01001	CHTB01001-M0609	5/26/2009	SW8260B	N1	METHYLENE CHLORIDE	WW		ND	0.19	2	µg/L	U
90PLT01001	CHTB01001-M0609	5/26/2009	SW8260B	N1	O-XYLENE (1,2-DIMETHYLBENZENE)	WW		ND	0.15	1	µg/L	U
90PLT01001	CHTB01001-M0609	5/26/2009	SW8260B	N1	STYRENE	WW		ND	0.13	1	µg/L	U
90PLT01001	CHTB01001-M0609	5/26/2009	SW8260B	N1	TETRACHLOROETHENE (PCE)	WW		ND	0.18	1	µg/L	U
90PLT01001	CHTB01001-M0609	5/26/2009	SW8260B	N1	TOLUENE	WW		ND	0.15	1	µg/L	U
90PLT01001	CHTB01001-M0609	5/26/2009	SW8260B	N1	TRICHLOROETHENE (TCE)	WW		ND	0.2	1	µg/L	U
90PLT01001	CHTB01001-M0609	5/26/2009	SW8260B	N1	VINYL CHLORIDE	WW		ND	0.2	1	µg/L	U
90PLT01001	CHTB01001-M0609	5/26/2009	SW8260B	N1	cis-1,2-DICHLOROETHENE	WW		ND	0.19	1	µg/L	U
90PLT01001	CHTB01001-M0609	5/26/2009	SW8260B	N1	cis-1,3-DICHLOROPROPENE	WW		ND	0.13	1	µg/L	U
90PLT01001	CHTB01001-M0609	5/26/2009	SW8260B	N1	tert-BUTYL METHYL ETHER	WW		ND	0.12	1	µg/L	U
90PLT01001	CHTB01001-M0609	5/26/2009	SW8260B	N1	trans-1,2-DICHLOROETHENE	WW		ND	0.22	1	µg/L	U
90PLT01001	CHTB01001-M0609	5/26/2009	SW8260B	N1	trans-1,3-DICHLOROPROPENE	WW		ND	0.1	1	µg/L	U
90PLT01023	CHTB01023-M0209	1/26/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		ND	0.002	0.01	µg/L	U
90PLT01023	CHTB01023-M0309	2/23/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		ND	0.002	0.01	µg/L	U

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Location	Sample ID	Date	Test	Type	Analyte	Matrix	Depth	Analyte Result	DL	RL	Units	Qual
90PLT01023	CHTB01023-M0409	3/25/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		ND	0.002	0.01	µg/L	U
90PLT01023	CHTB01023-M0509	4/24/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		ND	0.002	0.01	µg/L	U
90PLT01023	CHTB01023-M0609	5/26/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		ND	0.002	0.01	µg/L	U
90PLT01033	CHTB01033-M0209	1/26/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		ND	0.002	0.01	µg/L	U
90PLT01033	CHTB01033-M0309	2/23/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		BRL	0.002	0.01	µg/L	J
90PLT01033	CHTB01033-M0409	3/25/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		BRL	0.002	0.01	µg/L	J
90PLT01033	CHTB01033-M0509	4/24/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		BRL	0.002	0.01	µg/L	J
90PLT01033	CHTB01033-M0609	5/26/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		BRL	0.002	0.01	µg/L	J
90PLT01041	CHTB01041-M0409	3/25/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		ND	0.002	0.01	µg/L	U
90PLT01041	CHTB01041-M0509	4/24/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		ND	0.002	0.01	µg/L	U
90PLT01041	CHTB01041-M0609	5/26/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		ND	0.002	0.01	µg/L	U
90PLT01042	CHTB01042-M0209	1/26/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		BRL	0.002	0.01	µg/L	J
90PLT01042	CHTB01042-M0309	2/23/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		0.013	0.002	0.01	µg/L	
90PLT01053	CHTB01053-M0209	1/26/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		ND	0.002	0.01	µg/L	U
90PLT01053	CHTB01053-M0309	2/23/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		ND	0.002	0.01	µg/L	U
90PLT01053	CHTB01053-M0309	2/23/2009	SW8260B	N1	1,1,1-TRICHLOROETHANE	WW		ND	0.21	1	µg/L	U
90PLT01053	CHTB01053-M0309	2/23/2009	SW8260B	N1	1,1,2,2-TETRACHLOROETHANE	WW		ND	0.13	1	µg/L	U
90PLT01053	CHTB01053-M0309	2/23/2009	SW8260B	N1	1,1,2-TRICHLOROETHANE	WW		ND	0.13	1	µg/L	U
90PLT01053	CHTB01053-M0309	2/23/2009	SW8260B	N1	1,1-DICHLOROETHANE	WW		ND	0.17	1	µg/L	U
90PLT01053	CHTB01053-M0309	2/23/2009	SW8260B	N1	1,1-DICHLOROETHENE	WW		ND	0.19	1	µg/L	U
90PLT01053	CHTB01053-M0309	2/23/2009	SW8260B	N1	1,2,4-TRICHLOROBENZENE	WW		ND	0.18	1	µg/L	U
90PLT01053	CHTB01053-M0309	2/23/2009	SW8260B	N1	1,2-DIBROMO-3-CHLOROPROPANE	WW		ND	0.2	2	µg/L	U
90PLT01053	CHTB01053-M0309	2/23/2009	SW8260B	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		ND	0.14	1	µg/L	U
90PLT01053	CHTB01053-M0309	2/23/2009	SW8260B	N1	1,2-DICHLOROBENZENE	WW		ND	0.16	1	µg/L	U
90PLT01053	CHTB01053-M0309	2/23/2009	SW8260B	N1	1,2-DICHLOROETHANE	WW		ND	0.13	1	µg/L	U
90PLT01053	CHTB01053-M0309	2/23/2009	SW8260B	N1	1,2-DICHLOROPROPANE	WW		ND	0.13	1	µg/L	U
90PLT01053	CHTB01053-M0309	2/23/2009	SW8260B	N1	1,3-DICHLOROBENZENE	WW		ND	0.13	1	µg/L	U
90PLT01053	CHTB01053-M0309	2/23/2009	SW8260B	N1	1,4-DICHLOROBENZENE	WW		ND	0.14	1	µg/L	U
90PLT01053	CHTB01053-M0309	2/23/2009	SW8260B	N1	BENZENE	WW		ND	0.15	1	µg/L	U
90PLT01053	CHTB01053-M0309	2/23/2009	SW8260B	N1	BROMOCHLOROMETHANE	WW		ND	0.11	1	µg/L	U
90PLT01053	CHTB01053-M0309	2/23/2009	SW8260B	N1	BROMODICHLOROMETHANE	WW		ND	0.14	1	µg/L	U
90PLT01053	CHTB01053-M0309	2/23/2009	SW8260B	N1	BROMOFORM	WW		ND	0.12	1	µg/L	U
90PLT01053	CHTB01053-M0309	2/23/2009	SW8260B	N1	BROMOMETHANE	WW		ND	0.22	2	µg/L	U
90PLT01053	CHTB01053-M0309	2/23/2009	SW8260B	N1	CARBON TETRACHLORIDE	WW		ND	0.17	1	µg/L	U
90PLT01053	CHTB01053-M0309	2/23/2009	SW8260B	N1	CHLOROBENZENE	WW		ND	0.16	1	µg/L	U
90PLT01053	CHTB01053-M0309	2/23/2009	SW8260B	N1	CHLOROETHANE	WW		ND	0.23	1	µg/L	U
90PLT01053	CHTB01053-M0309	2/23/2009	SW8260B	N1	CHLOROFORM	WW		BRL	0.14	1	µg/L	J
90PLT01053	CHTB01053-M0309	2/23/2009	SW8260B	N1	CHLOROMETHANE	WW		ND	0.23	1	µg/L	U
90PLT01053	CHTB01053-M0309	2/23/2009	SW8260B	N1	DIBROMOCHLOROMETHANE	WW		ND	0.08	1	µg/L	U
90PLT01053	CHTB01053-M0309	2/23/2009	SW8260B	N1	ETHYLBENZENE	WW		ND	0.13	1	µg/L	U
90PLT01053	CHTB01053-M0309	2/23/2009	SW8260B	N1	M,P-XYLENE (SUM OF ISOMERS)	WW		ND	0.31	2	µg/L	U
90PLT01053	CHTB01053-M0309	2/23/2009	SW8260B	N1	METHYLENE CHLORIDE	WW		ND	0.19	2	µg/L	U
90PLT01053	CHTB01053-M0309	2/23/2009	SW8260B	N1	O-XYLENE (1,2-DIMETHYLBENZENE)	WW		ND	0.15	1	µg/L	U
90PLT01053	CHTB01053-M0309	2/23/2009	SW8260B	N1	STYRENE	WW		ND	0.13	1	µg/L	U
90PLT01053	CHTB01053-M0309	2/23/2009	SW8260B	N1	TETRACHLOROETHENE (PCE)	WW		ND	0.18	1	µg/L	U
90PLT01053	CHTB01053-M0309	2/23/2009	SW8260B	N1	TOLUENE	WW		ND	0.15	1	µg/L	U
90PLT01053	CHTB01053-M0309	2/23/2009	SW8260B	N1	TRICHLOROETHENE (TCE)	WW		ND	0.15	1	µg/L	U



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Location	Sample ID	Date	Test	Type	Analyte	Matrix	Depth	Analyte Result	DL	RL	Units	Qual
90PLT01053	CHTB01053-M0309	2/23/2009	SW8260B	N1	VINYL CHLORIDE	WW		ND	0.2	1	µg/L	U
90PLT01053	CHTB01053-M0309	2/23/2009	SW8260B	N1	cis-1,2-DICHLOROETHENE	WW		ND	0.19	1	µg/L	U
90PLT01053	CHTB01053-M0309	2/23/2009	SW8260B	N1	cis-1,3-DICHLOROPROPENE	WW		ND	0.13	1	µg/L	U
90PLT01053	CHTB01053-M0309	2/23/2009	SW8260B	N1	tert-BUTYL METHYL ETHER	WW		ND	0.12	1	µg/L	U
90PLT01053	CHTB01053-M0309	2/23/2009	SW8260B	N1	trans-1,2-DICHLOROETHENE	WW		ND	0.22	1	µg/L	U
90PLT01053	CHTB01053-M0309	2/23/2009	SW8260B	N1	trans-1,3-DICHLOROPROPENE	WW		ND	0.08	1	µg/L	U
90PLT01053	CHTB01053-M0409	3/25/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		ND	0.002	0.01	µg/L	U
90PLT01053	CHTB01053-M0509	4/24/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		ND	0.002	0.01	µg/L	U
90PLT01053	CHTB01053-M0609	5/26/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		BRL	0.002	0.01	µg/L	J
90PLT01053	CHTB01053-M0609	5/26/2009	SW8260B	N1	1,1,1-TRICHLOROETHANE	WW		ND	0.21	1	µg/L	U
90PLT01053	CHTB01053-M0609	5/26/2009	SW8260B	N1	1,1,2,2-TETRACHLOROETHANE	WW		ND	0.13	1	µg/L	U
90PLT01053	CHTB01053-M0609	5/26/2009	SW8260B	N1	1,1,2-TRICHLOROETHANE	WW		ND	0.13	1	µg/L	U
90PLT01053	CHTB01053-M0609	5/26/2009	SW8260B	N1	1,1-DICHLOROETHANE	WW		ND	0.17	1	µg/L	U
90PLT01053	CHTB01053-M0609	5/26/2009	SW8260B	N1	1,1-DICHLOROETHENE	WW		ND	0.19	1	µg/L	U
90PLT01053	CHTB01053-M0609	5/26/2009	SW8260B	N1	1,2,4-TRICHLOROBENZENE	WW		ND	0.18	1	µg/L	U
90PLT01053	CHTB01053-M0609	5/26/2009	SW8260B	N1	1,2-DIBROMO-3-CHLOROPROPANE	WW		ND	0.13	2	µg/L	U
90PLT01053	CHTB01053-M0609	5/26/2009	SW8260B	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		ND	0.14	1	µg/L	U
90PLT01053	CHTB01053-M0609	5/26/2009	SW8260B	N1	1,2-DICHLOROBENZENE	WW		ND	0.16	1	µg/L	U
90PLT01053	CHTB01053-M0609	5/26/2009	SW8260B	N1	1,2-DICHLOROETHANE	WW		ND	0.13	1	µg/L	U
90PLT01053	CHTB01053-M0609	5/26/2009	SW8260B	N1	1,2-DICHLOROPROPANE	WW		ND	0.13	1	µg/L	U
90PLT01053	CHTB01053-M0609	5/26/2009	SW8260B	N1	1,3-DICHLOROBENZENE	WW		ND	0.13	1	µg/L	U
90PLT01053	CHTB01053-M0609	5/26/2009	SW8260B	N1	1,4-DICHLOROBENZENE	WW		ND	0.14	1	µg/L	U
90PLT01053	CHTB01053-M0609	5/26/2009	SW8260B	N1	BENZENE	WW		ND	0.15	1	µg/L	U
90PLT01053	CHTB01053-M0609	5/26/2009	SW8260B	N1	BROMOCHLOROMETHANE	WW		ND	0.12	1	µg/L	U
90PLT01053	CHTB01053-M0609	5/26/2009	SW8260B	N1	BROMODICHLOROMETHANE	WW		ND	0.14	1	µg/L	U
90PLT01053	CHTB01053-M0609	5/26/2009	SW8260B	N1	BROMOFORM	WW		ND	0.12	1	µg/L	U
90PLT01053	CHTB01053-M0609	5/26/2009	SW8260B	N1	BROMOMETHANE	WW		ND	0.22	2	µg/L	U
90PLT01053	CHTB01053-M0609	5/26/2009	SW8260B	N1	CARBON TETRACHLORIDE	WW		ND	0.17	1	µg/L	U
90PLT01053	CHTB01053-M0609	5/26/2009	SW8260B	N1	CHLOROBENZENE	WW		ND	0.16	1	µg/L	U
90PLT01053	CHTB01053-M0609	5/26/2009	SW8260B	N1	CHLOROETHANE	WW		ND	0.23	1	µg/L	U
90PLT01053	CHTB01053-M0609	5/26/2009	SW8260B	N1	CHLOROFORM	WW		1	0.14	1	µg/L	
90PLT01053	CHTB01053-M0609	5/26/2009	SW8260B	N1	CHLOROMETHANE	WW		ND	0.23	1	µg/L	U
90PLT01053	CHTB01053-M0609	5/26/2009	SW8260B	N1	DIBROMOCHLOROMETHANE	WW		ND	0.08	1	µg/L	U
90PLT01053	CHTB01053-M0609	5/26/2009	SW8260B	N1	ETHYLBENZENE	WW		ND	0.13	1	µg/L	U
90PLT01053	CHTB01053-M0609	5/26/2009	SW8260B	N1	M,P-XYLENE (SUM OF ISOMERS)	WW		ND	0.31	2	µg/L	U
90PLT01053	CHTB01053-M0609	5/26/2009	SW8260B	N1	METHYLENE CHLORIDE	WW		ND	0.19	2	µg/L	U
90PLT01053	CHTB01053-M0609	5/26/2009	SW8260B	N1	O-XYLENE (1,2-DIMETHYLBENZENE)	WW		ND	0.15	1	µg/L	U
90PLT01053	CHTB01053-M0609	5/26/2009	SW8260B	N1	STYRENE	WW		ND	0.13	1	µg/L	U
90PLT01053	CHTB01053-M0609	5/26/2009	SW8260B	N1	TETRACHLOROETHENE (PCE)	WW		ND	0.18	1	µg/L	U
90PLT01053	CHTB01053-M0609	5/26/2009	SW8260B	N1	TOLUENE	WW		ND	0.15	1	µg/L	U
90PLT01053	CHTB01053-M0609	5/26/2009	SW8260B	N1	TRICHLOROETHENE (TCE)	WW		ND	0.2	1	µg/L	U
90PLT01053	CHTB01053-M0609	5/26/2009	SW8260B	N1	VINYL CHLORIDE	WW		ND	0.2	1	µg/L	U
90PLT01053	CHTB01053-M0609	5/26/2009	SW8260B	N1	cis-1,2-DICHLOROETHENE	WW		ND	0.19	1	µg/L	U
90PLT01053	CHTB01053-M0609	5/26/2009	SW8260B	N1	cis-1,3-DICHLOROPROPENE	WW		ND	0.13	1	µg/L	U
90PLT01053	CHTB01053-M0609	5/26/2009	SW8260B	N1	tert-BUTYL METHYL ETHER	WW		ND	0.12	1	µg/L	U
90PLT01053	CHTB01053-M0609	5/26/2009	SW8260B	N1	trans-1,2-DICHLOROETHENE	WW		ND	0.22	1	µg/L	U
90PLT01053	CHTB01053-M0609	5/26/2009	SW8260B	N1	trans-1,3-DICHLOROPROPENE	WW		ND	0.1	1	µg/L	U



**Attachment C-1**  
**Analytical Laboratory Results, January - September 2009**  
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Location	Sample ID	Date	Test	Type	Analyte	Matrix	Depth	Analyte Result	DL	RL	Units	Qual
90SW0001	CHPV09001-S0109	5/11/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WS		ND	0.002	0.01	µg/L	U
90SW0002	CHPV19002-S0109	5/11/2009	E504.1	FD1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WS		ND	0.002	0.01	µg/L	U
90SW0002	CHPV09002-S0109	5/11/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WS		ND	0.002	0.01	µg/L	U
96SV0004	CHPD00294-A0109	5/18/2009	SW8260B	N1	1,1,1-TRICHLOROETHANE	WG	84.5	ND	0.21	1	µg/L	U
96SV0004	CHPD00294-A0109	5/18/2009	SW8260B	N1	1,1,2,2-TETRACHLOROETHANE	WG	84.5	ND	0.13	1	µg/L	U
96SV0004	CHPD00294-A0109	5/18/2009	SW8260B	N1	1,1,2-TRICHLOROETHANE	WG	84.5	ND	0.13	1	µg/L	U
96SV0004	CHPD00294-A0109	5/18/2009	SW8260B	N1	1,1-DICHLOROETHANE	WG	84.5	ND	0.17	1	µg/L	U
96SV0004	CHPD00294-A0109	5/18/2009	SW8260B	N1	1,1-DICHLOROETHENE	WG	84.5	ND	0.19	1	µg/L	U
96SV0004	CHPD00294-A0109	5/18/2009	SW8260B	N1	1,2,4-TRICHLOROBENZENE	WG	84.5	ND	0.18	1	µg/L	U
96SV0004	CHPD00294-A0109	5/18/2009	SW8260B	N1	1,2-DIBROMO-3-CHLOROPROPANE	WG	84.5	ND	0.13	2	µg/L	U
96SV0004	CHPD00294-A0109	5/18/2009	SW8260B	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	84.5	ND	0.14	1	µg/L	U
96SV0004	CHPD00294-A0109	5/18/2009	SW8260B	N1	1,2-DICHLOROBENZENE	WG	84.5	ND	0.16	1	µg/L	U
96SV0004	CHPD00294-A0109	5/18/2009	SW8260B	N1	1,2-DICHLOROETHANE	WG	84.5	ND	0.13	1	µg/L	U
96SV0004	CHPD00294-A0109	5/18/2009	SW8260B	N1	1,2-DICHLOROPROPANE	WG	84.5	ND	0.13	1	µg/L	U
96SV0004	CHPD00294-A0109	5/18/2009	SW8260B	N1	1,3-DICHLOROBENZENE	WG	84.5	ND	0.13	1	µg/L	U
96SV0004	CHPD00294-A0109	5/18/2009	SW8260B	N1	1,4-DICHLOROBENZENE	WG	84.5	ND	0.14	1	µg/L	U
96SV0004	CHPD00294-A0109	5/18/2009	SW8260B	N1	BENZENE	WG	84.5	1.1	0.15	1	µg/L	
96SV0004	CHPD00294-A0109	5/18/2009	SW8260B	N1	BROMOCHLOROMETHANE	WG	84.5	ND	0.12	1	µg/L	U
96SV0004	CHPD00294-A0109	5/18/2009	SW8260B	N1	BROMODICHLOROMETHANE	WG	84.5	ND	0.14	1	µg/L	U
96SV0004	CHPD00294-A0109	5/18/2009	SW8260B	N1	BROMOFORM	WG	84.5	ND	0.12	1	µg/L	U
96SV0004	CHPD00294-A0109	5/18/2009	SW8260B	N1	BROMOMETHANE	WG	84.5	ND	0.22	2	µg/L	U
96SV0004	CHPD00294-A0109	5/18/2009	SW8260B	N1	CARBON TETRACHLORIDE	WG	84.5	ND	0.17	1	µg/L	U
96SV0004	CHPD00294-A0109	5/18/2009	SW8260B	N1	CHLOROBENZENE	WG	84.5	ND	0.16	1	µg/L	U
96SV0004	CHPD00294-A0109	5/18/2009	SW8260B	N1	CHLOROETHANE	WG	84.5	ND	0.23	1	µg/L	U
96SV0004	CHPD00294-A0109	5/18/2009	SW8260B	N1	CHLOROFORM	WG	84.5	ND	0.14	1	µg/L	U
96SV0004	CHPD00294-A0109	5/18/2009	SW8260B	N1	CHLOROMETHANE	WG	84.5	ND	0.23	1	µg/L	U
96SV0004	CHPD00294-A0109	5/18/2009	SW8260B	N1	DIBROMOCHLOROMETHANE	WG	84.5	ND	0.08	1	µg/L	U
96SV0004	CHPD00294-A0109	5/18/2009	SW8260B	N1	ETHYLBENZENE	WG	84.5	230	1.3	10	µg/L	
96SV0004	CHPD00294-A0109	5/18/2009	SW8260B	N1	M,P-XYLENE (SUM OF ISOMERS)	WG	84.5	748	3.1	20	µg/L	
96SV0004	CHPD00294-A0109	5/18/2009	SW8260B	N1	METHYLENE CHLORIDE	WG	84.5	ND	0.19	2	µg/L	U
96SV0004	CHPD00294-A0109	5/18/2009	SW8260B	N1	O-XYLENE (1,2-DIMETHYLBENZENE)	WG	84.5	312	1.5	10	µg/L	
96SV0004	CHPD00294-A0109	5/18/2009	SW8260B	N1	STYRENE	WG	84.5	BRL	0.13	1	µg/L	J
96SV0004	CHPD00294-A0109	5/18/2009	SW8260B	N1	TETRACHLOROETHENE (PCE)	WG	84.5	ND	0.18	1	µg/L	U
96SV0004	CHPD00294-A0109	5/18/2009	SW8260B	N1	TOLUENE	WG	84.5	41.7	0.15	1	µg/L	
96SV0004	CHPD00294-A0109	5/18/2009	SW8260B	N1	TRICHLOROETHENE (TCE)	WG	84.5	ND	0.2	1	µg/L	U
96SV0004	CHPD00294-A0109	5/18/2009	SW8260B	N1	VINYL CHLORIDE	WG	84.5	ND	0.2	1	µg/L	U
96SV0004	CHPD00294-A0109	5/18/2009	SW8260B	N1	cis-1,2-DICHLOROETHENE	WG	84.5	ND	0.19	1	µg/L	U
96SV0004	CHPD00294-A0109	5/18/2009	SW8260B	N1	cis-1,3-DICHLOROPROPENE	WG	84.5	ND	0.13	1	µg/L	U
96SV0004	CHPD00294-A0109	5/18/2009	SW8260B	N1	tert-BUTYL METHYL ETHER	WG	84.5	ND	0.12	1	µg/L	U
96SV0004	CHPD00294-A0109	5/18/2009	SW8260B	N1	trans-1,2-DICHLOROETHENE	WG	84.5	ND	0.22	1	µg/L	U
96SV0004	CHPD00294-A0109	5/18/2009	SW8260B	N1	trans-1,3-DICHLOROPROPENE	WG	84.5	ND	0.1	1	µg/L	U
96SV0006	CHPD00295-A0109	5/18/2009	SW8260B	N1	1,1,1-TRICHLOROETHANE	WG	90.2	ND	1.1	5	µg/L	U
96SV0006	CHPD00295-A0109	5/18/2009	SW8260B	N1	1,1,2,2-TETRACHLOROETHANE	WG	90.2	ND	0.65	5	µg/L	U
96SV0006	CHPD00295-A0109	5/18/2009	SW8260B	N1	1,1,2-TRICHLOROETHANE	WG	90.2	ND	0.65	5	µg/L	U
96SV0006	CHPD00295-A0109	5/18/2009	SW8260B	N1	1,1-DICHLOROETHANE	WG	90.2	ND	0.85	5	µg/L	U
96SV0006	CHPD00295-A0109	5/18/2009	SW8260B	N1	1,1-DICHLOROETHENE	WG	90.2	ND	0.95	5	µg/L	U
96SV0006	CHPD00295-A0109	5/18/2009	SW8260B	N1	1,2,4-TRICHLOROBENZENE	WG	90.2	ND	0.9	5	µg/L	U

**Attachment C-1**  
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Location	Sample ID	Date	Test	Type	Analyte	Matrix	Depth	Analyte Result	DL	RL	Units	Qual
96SV0006	CHPD00295-A0109	5/18/2009	SW8260B	N1	1,2-DIBROMO-3-CHLOROPROPANE	WG	90.2	ND	0.65	10	µg/L	U
96SV0006	CHPD00295-A0109	5/18/2009	SW8260B	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	90.2	ND	0.7	5	µg/L	U
96SV0006	CHPD00295-A0109	5/18/2009	SW8260B	N1	1,2-DICHLOROBENZENE	WG	90.2	ND	0.8	5	µg/L	U
96SV0006	CHPD00295-A0109	5/18/2009	SW8260B	N1	1,2-DICHLOROETHANE	WG	90.2	ND	0.65	5	µg/L	U
96SV0006	CHPD00295-A0109	5/18/2009	SW8260B	N1	1,2-DICHLOROPROPANE	WG	90.2	ND	0.65	5	µg/L	U
96SV0006	CHPD00295-A0109	5/18/2009	SW8260B	N1	1,3-DICHLOROBENZENE	WG	90.2	ND	0.65	5	µg/L	U
96SV0006	CHPD00295-A0109	5/18/2009	SW8260B	N1	1,4-DICHLOROBENZENE	WG	90.2	ND	0.7	5	µg/L	U
96SV0006	CHPD00295-A0109	5/18/2009	SW8260B	N1	BENZENE	WG	90.2	ND	0.75	5	µg/L	U
96SV0006	CHPD00295-A0109	5/18/2009	SW8260B	N1	BROMOCHLOROMETHANE	WG	90.2	ND	0.6	5	µg/L	U
96SV0006	CHPD00295-A0109	5/18/2009	SW8260B	N1	BROMODICHLOROMETHANE	WG	90.2	ND	0.7	5	µg/L	U
96SV0006	CHPD00295-A0109	5/18/2009	SW8260B	N1	BROMOFORM	WG	90.2	ND	0.6	5	µg/L	U
96SV0006	CHPD00295-A0109	5/18/2009	SW8260B	N1	BROMOMETHANE	WG	90.2	ND	1.1	10	µg/L	U
96SV0006	CHPD00295-A0109	5/18/2009	SW8260B	N1	CARBON TETRACHLORIDE	WG	90.2	ND	0.85	5	µg/L	U
96SV0006	CHPD00295-A0109	5/18/2009	SW8260B	N1	CHLOROBENZENE	WG	90.2	ND	0.8	5	µg/L	U
96SV0006	CHPD00295-A0109	5/18/2009	SW8260B	N1	CHLOROETHANE	WG	90.2	ND	1.2	5	µg/L	U
96SV0006	CHPD00295-A0109	5/18/2009	SW8260B	N1	CHLOROFORM	WG	90.2	ND	0.7	5	µg/L	U
96SV0006	CHPD00295-A0109	5/18/2009	SW8260B	N1	CHLOROMETHANE	WG	90.2	ND	1.2	5	µg/L	U
96SV0006	CHPD00295-A0109	5/18/2009	SW8260B	N1	DIBROMOCHLOROMETHANE	WG	90.2	ND	0.4	5	µg/L	U
96SV0006	CHPD00295-A0109	5/18/2009	SW8260B	N1	ETHYLBENZENE	WG	90.2	303	0.65	5	µg/L	
96SV0006	CHPD00295-A0109	5/18/2009	SW8260B	N1	M,P-XYLENE (SUM OF ISOMERS)	WG	90.2	918	1.6	10	µg/L	
96SV0006	CHPD00295-A0109	5/18/2009	SW8260B	N1	METHYLENE CHLORIDE	WG	90.2	ND	0.95	10	µg/L	U
96SV0006	CHPD00295-A0109	5/18/2009	SW8260B	N1	O-XYLENE (1,2-DIMETHYLBENZENE)	WG	90.2	317	0.75	5	µg/L	
96SV0006	CHPD00295-A0109	5/18/2009	SW8260B	N1	STYRENE	WG	90.2	1.3	0.65	5	µg/L	J
96SV0006	CHPD00295-A0109	5/18/2009	SW8260B	N1	TETRACHLOROETHENE (PCE)	WG	90.2	ND	0.9	5	µg/L	U
96SV0006	CHPD00295-A0109	5/18/2009	SW8260B	N1	TOLUENE	WG	90.2	23.7	0.75	5	µg/L	
96SV0006	CHPD00295-A0109	5/18/2009	SW8260B	N1	TRICHLOROETHENE (TCE)	WG	90.2	ND	1	5	µg/L	U
96SV0006	CHPD00295-A0109	5/18/2009	SW8260B	N1	VINYL CHLORIDE	WG	90.2	ND	1	5	µg/L	U
96SV0006	CHPD00295-A0109	5/18/2009	SW8260B	N1	cis-1,2-DICHLOROETHENE	WG	90.2	ND	0.95	5	µg/L	U
96SV0006	CHPD00295-A0109	5/18/2009	SW8260B	N1	cis-1,3-DICHLOROPROPENE	WG	90.2	ND	0.65	5	µg/L	U
96SV0006	CHPD00295-A0109	5/18/2009	SW8260B	N1	tert-BUTYL METHYL ETHER	WG	90.2	ND	0.6	5	µg/L	U
96SV0006	CHPD00295-A0109	5/18/2009	SW8260B	N1	trans-1,2-DICHLOROETHENE	WG	90.2	ND	1.1	5	µg/L	U
96SV0006	CHPD00295-A0109	5/18/2009	SW8260B	N1	trans-1,3-DICHLOROPROPENE	WG	90.2	ND	0.5	5	µg/L	U
96SV0013	CHPD00296-A0109	5/18/2009	SW8260B	N1	1,1,1-TRICHLOROETHANE	WG	90	ND	1.1	5	µg/L	U
96SV0013	CHPD00296-A0109	5/18/2009	SW8260B	N1	1,1,2,2-TETRACHLOROETHANE	WG	90	ND	0.65	5	µg/L	U
96SV0013	CHPD00296-A0109	5/18/2009	SW8260B	N1	1,1,2-TRICHLOROETHANE	WG	90	ND	0.65	5	µg/L	U
96SV0013	CHPD00296-A0109	5/18/2009	SW8260B	N1	1,1-DICHLOROETHANE	WG	90	ND	0.85	5	µg/L	U
96SV0013	CHPD00296-A0109	5/18/2009	SW8260B	N1	1,1-DICHLOROETHENE	WG	90	ND	0.95	5	µg/L	U
96SV0013	CHPD00296-A0109	5/18/2009	SW8260B	N1	1,2,4-TRICHLOROBENZENE	WG	90	ND	0.9	5	µg/L	U
96SV0013	CHPD00296-A0109	5/18/2009	SW8260B	N1	1,2-DIBROMO-3-CHLOROPROPANE	WG	90	ND	0.65	10	µg/L	U
96SV0013	CHPD00296-A0109	5/18/2009	SW8260B	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	90	ND	0.7	5	µg/L	U
96SV0013	CHPD00296-A0109	5/18/2009	SW8260B	N1	1,2-DICHLOROBENZENE	WG	90	ND	0.8	5	µg/L	U
96SV0013	CHPD00296-A0109	5/18/2009	SW8260B	N1	1,2-DICHLOROETHANE	WG	90	ND	0.65	5	µg/L	U
96SV0013	CHPD00296-A0109	5/18/2009	SW8260B	N1	1,2-DICHLOROPROPANE	WG	90	ND	0.65	5	µg/L	U
96SV0013	CHPD00296-A0109	5/18/2009	SW8260B	N1	1,3-DICHLOROBENZENE	WG	90	ND	0.65	5	µg/L	U
96SV0013	CHPD00296-A0109	5/18/2009	SW8260B	N1	1,4-DICHLOROBENZENE	WG	90	ND	0.7	5	µg/L	U
96SV0013	CHPD00296-A0109	5/18/2009	SW8260B	N1	BENZENE	WG	90	ND	0.75	5	µg/L	U
96SV0013	CHPD00296-A0109	5/18/2009	SW8260B	N1	BROMOCHLOROMETHANE	WG	90	ND	0.6	5	µg/L	U

**Attachment C-1**  
**Analytical Laboratory Results, January - September 2009**  
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Location	Sample ID	Date	Test	Type	Analyte	Matrix	Depth	Analyte Result	DL	RL	Units	Qual
96SV0013	CHPD00296-A0109	5/18/2009	SW8260B	N1	BROMODICHLOROMETHANE	WG	90	ND	0.7	5	µg/L	U
96SV0013	CHPD00296-A0109	5/18/2009	SW8260B	N1	BROMOFORM	WG	90	ND	0.6	5	µg/L	U
96SV0013	CHPD00296-A0109	5/18/2009	SW8260B	N1	BROMOMETHANE	WG	90	ND	1.1	10	µg/L	U
96SV0013	CHPD00296-A0109	5/18/2009	SW8260B	N1	CARBON TETRACHLORIDE	WG	90	ND	0.85	5	µg/L	U
96SV0013	CHPD00296-A0109	5/18/2009	SW8260B	N1	CHLOROBENZENE	WG	90	ND	0.8	5	µg/L	U
96SV0013	CHPD00296-A0109	5/18/2009	SW8260B	N1	CHLOROETHANE	WG	90	ND	1.2	5	µg/L	U
96SV0013	CHPD00296-A0109	5/18/2009	SW8260B	N1	CHLOROFORM	WG	90	ND	0.7	5	µg/L	U
96SV0013	CHPD00296-A0109	5/18/2009	SW8260B	N1	CHLOROMETHANE	WG	90	ND	1.2	5	µg/L	U
96SV0013	CHPD00296-A0109	5/18/2009	SW8260B	N1	DIBROMOCHLOROMETHANE	WG	90	ND	0.4	5	µg/L	U
96SV0013	CHPD00296-A0109	5/18/2009	SW8260B	N1	ETHYLBENZENE	WG	90	75.5	0.65	5	µg/L	
96SV0013	CHPD00296-A0109	5/18/2009	SW8260B	N1	M,P-XYLENE (SUM OF ISOMERS)	WG	90	278	1.6	10	µg/L	
96SV0013	CHPD00296-A0109	5/18/2009	SW8260B	N1	METHYLENE CHLORIDE	WG	90	ND	0.95	10	µg/L	U
96SV0013	CHPD00296-A0109	5/18/2009	SW8260B	N1	O-XYLENE (1,2-DIMETHYLBENZENE)	WG	90	105	0.75	5	µg/L	
96SV0013	CHPD00296-A0109	5/18/2009	SW8260B	N1	STYRENE	WG	90	ND	0.65	5	µg/L	U
96SV0013	CHPD00296-A0109	5/18/2009	SW8260B	N1	TETRACHLOROETHENE (PCE)	WG	90	ND	0.9	5	µg/L	U
96SV0013	CHPD00296-A0109	5/18/2009	SW8260B	N1	TOLUENE	WG	90	3.1	0.75	5	µg/L	J
96SV0013	CHPD00296-A0109	5/18/2009	SW8260B	N1	TRICHLOROETHENE (TCE)	WG	90	ND	1	5	µg/L	U
96SV0013	CHPD00296-A0109	5/18/2009	SW8260B	N1	VINYL CHLORIDE	WG	90	ND	1	5	µg/L	U
96SV0013	CHPD00296-A0109	5/18/2009	SW8260B	N1	cis-1,2-DICHLOROETHENE	WG	90	ND	0.95	5	µg/L	U
96SV0013	CHPD00296-A0109	5/18/2009	SW8260B	N1	cis-1,3-DICHLOROPROPENE	WG	90	ND	0.65	5	µg/L	U
96SV0013	CHPD00296-A0109	5/18/2009	SW8260B	N1	tert-BUTYL METHYL ETHER	WG	90	ND	0.6	5	µg/L	U
96SV0013	CHPD00296-A0109	5/18/2009	SW8260B	N1	trans-1,2-DICHLOROETHENE	WG	90	ND	1.1	5	µg/L	U
96SV0013	CHPD00296-A0109	5/18/2009	SW8260B	N1	trans-1,3-DICHLOROPROPENE	WG	90	ND	0.5	5	µg/L	U
MW-169M1	CHPD00300-A0109	5/15/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	156.5	ND	0.002	0.01	µg/L	U
MW-169M2	CHPD00301-A0109	5/12/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	116	ND	0.002	0.01	µg/L	U
MW-242M2	CHPD00299-A0109	5/22/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	170	BRL	0.002	0.01	µg/L	J
90MW0106A	CHPD00106A-O0909	9/29/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	224.92	0.022	0.005	0.01	µg/L	
90MW0106B	CHPD00106B-O0909	9/30/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	212.33	11	0.481	0.961	µg/L	
90MW0106C	CHPD00106C-O0909	9/30/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	192.24	1.03	0.024	0.048	µg/L	

Data Source: AFCEE, January 2010, MMR-AFCEE Data Warehouse

Key:

BRL = below reporting limit

DL = detection limit

FD1 = field duplicate

J = estimated value

ND = nondetect

N1 = native sample

RL = reporting limit

U = undetected

WG = groundwater

WS = surface water

WW = wastewater

µg/L = micrograms per liter

## **ATTACHMENT C-2**

### **Data Summary Report for Data Collected Under AFCEE ECOS Task Order**

**(June 2009 through December 2009)**

**Attachment C-2**  
**Data Summary Report**  
**FS-12 2009 Summary Letter Report**

## **INTRODUCTION**

The objective of this data summary report (DSR) is to assess the data quality of analytical results for samples collected from the Fuel Spill-12 (FS-12) Source Area under the System Performance and Ecological Impact Monitoring (SPEIM) Program at the Massachusetts Military Reservation (MMR), as presented in the *Fuel Spill-12 (FS-12) 2009 Summary Letter Report*. This report is intended as a general data quality assessment designed to summarize data issues.

## **ANALYTICAL DATA**

This DSR covers 4 borewater samples, 27 groundwater samples with one field duplicate sample, 2 surface water samples, and 36 plant samples. Field duplicates are not required for plant samples from the treatment facility. These samples were reported under 16 sample delivery groups (SDGs). The samples were collected between 21 May 2009 and 30 December 2009. The analyses were performed by Alpha Analytical Laboratories (Alpha), Westborough, Massachusetts. All samples were collected and shipped same-day via Alpha courier for analysis. The samples were analyzed for one or more of the analytes/methods provided in Table C2-1.

**Table C2-1**  
**Analytical Parameter**

<b>Parameter</b>	<b>Method</b>	<b>Laboratory</b>
1,2-Dibromoethane (Ethylene Dibromide)	E504.1	Alpha
Volatile Organic Compounds	SW8260B	Alpha

E = Environmental Protection Agency (EPA) Method  
SW = SW-846 Test Methods for Evaluating Solid Waste, 3rd Edition, Revision 4, 1996

The data were assessed using the MMR SPEIM, Long-Term Monitoring (LTM), and Operations and Maintenance (O&M) Program, Quality Assurance Project Plan (QAPP)<sup>1</sup>,

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<sup>1</sup> AFCEE. 2009 (April). *Quality Assurance Project Plan for the MMR SPEIM/LTM/O&M Program*. Prepared by CH2M HILL for AFCEE/MMR Installation Restoration Program, Otis Air National Guard Base, MA.

QAPP Addendum<sup>2</sup>, and the U.S. Environmental Protection Agency (USEPA) Region I Data Validation Functional Guidelines (VFGs)<sup>3</sup>. The assessment included a review of the following:

- Sample delivery and condition,
- Chain-of-custody documentation,
- Holding-time compliance,
- Required quality control (QC) samples at the specified frequencies,
- Method blanks,
- Laboratory control spiking samples,
- Surrogate spike recoveries,
- Internal standards and instrument tuning,
- Matrix spike/matrix spike duplicate (MS/MSD) samples, if performed, on a site/location basis,
- Initial and continuing calibrations, and other method-specific criteria as defined by the QAPP and USEPA Region I VFGs.

Field samples were reviewed to ascertain field compliance and data quality issues. This included a review of trip blanks (TB), equipment blanks (EB), and the field duplicate.

Data were carried through USEPA Region I Tier II data validation for 87 percent of the SDGs and through USEPA Region I Tier III data validation for 13 percent of the SDGs. Data flags were assigned, if necessary, according to the MMR QAPP and USEPA Region I VFGs. These flags, and the reason for each flag, were entered into the electronic database and can be found in Table C2-2 (located at the end of this report). Multiple flags are routinely applied to specific sample method/matrix/analyte combinations, but only one final flag is assigned. A final flag is applied to the data and is

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<sup>2</sup> AFCEE. 2009 (July). *Final Quality Assurance Project Plan Addendum Long-Term Monitoring and Operations and Maintenance Programs, Massachusetts Military Reservation and Hanscom Air Force Base, Massachusetts*. Prepared by HydroGeologic, Inc. for MMR Installation Restoration Program, Department of the Air Force Otis Air National Guard Base, MA.

<sup>3</sup> USEPA. 1996 (December). *USEPA Region I New England Data Validation Functional Guidelines for Evaluating Environmental Analyses*.

the most conservative of the applied validation flags. The final flag also includes matrix and blank sample impacts.

The data flags are listed in the MMR QAPP and USEPA Region I VFGs, and are defined as follows:

- No qualifier = Analyte was detected at the reported concentration.
- J = Analyte was detected at the reported concentration; the quantitation is an estimate.
- U = Analyte was analyzed for but not detected. The associated numerical value is the reporting limit (RL). This qualifier is also applied to results considered to be artifacts based on contamination in associated blanks.
- UJ = Analyte was analyzed for but not detected. The associated numerical value is the RL, which is estimated due to deficiencies in the quality control (QC) criteria. This qualifier is also applied to results considered to be artifacts based on contamination in associated blanks and have other associated QC discrepancies.
- R = Analyte was rejected due to deficiencies in the ability to analyze the sample and meet QC criteria.
- X = Excluded. The data point is associated with reanalyses or diluted analyses and is excluded because another result has been selected as the definitive result for the analyte.

## **FINDINGS**

Summaries of the data validation findings are contained in the following subsections and Table C2-2.

### **Sample Delivery and Condition**

All samples were received in acceptable condition and were properly preserved. No sample condition flags were applied.

### **Holding Times**

All holding-time criteria were met. No holding time flags were applied.

## **Calibration**

Initial, initial verification, and continuing calibrations were analyzed as required for every analytical batch and were in control with the following exception. For one Method SW8260B continuing calibration, target analyte bromomethane exceeded the QAPP and USEPA Region I Volatile/Semivolatile VFG percent difference (%D) criteria. The bromomethane results for the associated samples were non-detections and, therefore, were qualified UJ.

## **Method Blanks**

Method blanks were analyzed at the required frequency for each method. No method blank flags were applied.

## **Field Blanks**

TBs and EBs were collected and analyzed at the required frequency. No field blank flags were applied.

## **Field Duplicates**

Field duplicates were collected as required, and precision was acceptable overall. No field duplicate flags were applied.

## **Confirmation Column Precision**

The primary and confirmation column precision for all Method E504.1 analyses were acceptable overall. No flags were applied.

## **Matrix Spike Samples**

MS/MSDs analyses were not requested or performed on any sample associated with the SDGs in this report.



## **Surrogates**

Surrogate recoveries for each method were within the MMR QAPP and USEPA Region I VFG acceptance limits, with the following exception. Surrogate 1,1,1,2-tetrachloroethane was recovered above the Method E504.1 upper control limit for one sample; the 1,2-dibromoethane detection for this sample was qualified J.

## **Laboratory Control Samples**

Laboratory control samples (LCS) and LCS duplicates (LCSD) were analyzed as required and in control. No LCS/LCSD flags were applied.

## **Internal Standards and Instrument Tuning**

All internal standards met the peak area and retention time criteria. All sample analytical sequences were performed within 12 hours of an acceptable instrument tune. No internal standard or instrument tuning flags were applied.

## **Chain of Custody**

No chain-of-custody anomalies were noted in the review. No flags were applied.

## **Excluded Samples**

Several samples were flagged with an X appended to the laboratory-applied qualifier to denote that the results were removed due to required dilutions or reanalyses. Each removed data point was replaced with a result that was selected by the validator as the definitive result for the analyte. X-qualified data are not presented in Table C2-2, as the flag is not an indication of data quality, but a notation that the result was not used.

## **Overall Assessment**

The goal of this assessment is to demonstrate that a sufficient number of representative samples were collected and that the resulting analytical data can be used to support the decision-making process. The procedures for assessing the precision, accuracy,

representativeness, completeness, and comparability parameters (PARCC) are addressed in the MMR QAPP and USEPA Region I VFGs. The following summary highlights the PARCC findings for the above-defined events:

1. The completeness goal for valid usable data is 95 percent for aqueous samples. Completeness for the FS-12 samples was 100 percent, and the completeness goal was met for all compounds.
2. The routinely acceptable performance of field and laboratory QC indicators (field duplicates, field blanks, laboratory blanks, MS/MSDs, surrogate spikes, LCS, and calibrations) generally shows that the precision and accuracy of the data meet project objectives. The exceedance in the Method SW8260B continuing calibration is believed to be caused by instrument baseline drift and/or standard preparation error in the analytical process. The recovery exceedance in the Method E504.1 surrogate is believed to be caused by sample heterogeneity or matrix interference in the analytical process.
3. Sample results are representative and comparable to field conditions and past historical data because the field sampling and laboratory analyses were performed using standardized and documented procedures as defined in project documents. In addition, all results were reported with industry standard units.

**Table C2-2  
Validation Flags<sup>a</sup>**

Field ID	Method	Analyte	Final Result	Units	Final Flag	Reason
90PLT01001-WW-082809	SW8260B	Bromomethane	2.0	µg/L	UJ	CCVD
90PLT01053-WW-082809	SW8260B	Bromomethane	2.0	µg/L	UJ	CCVD
90PLT01023-WW-082809	E504.1	1,2-Dibromoethane	0.011	µg/L	J	SSH

<sup>a</sup> Only field samples and field duplicates, if applicable, are reported in this table.

Table sorted by Reason, Analyte and Field ID.

Notes:

CCVD = Target analyte outside of acceptable continuing calibration %D range.

SSH = Surrogate recovery greater than upper control limit.

µg/L = micrograms per liter

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**Analytical Laboratory Results, June - December 2009**  
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Location	Sample ID	Date	Test	Type	Analyte	Matrix	Depth	Analyte Result	DL	RL	Units	Qual
90DP0003	90DP0003-WG-121809-DIF	12/18/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	211	ND	0.003	0.01	µg/L	U
90DP0006	90DP0006-WG-121709	12/17/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	157.4	0.101	0.003	0.01	µg/L	
90DP0009	90DP0009-WG-121709	12/17/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	155	0.022	0.003	0.01	µg/L	
90DP1003	90DP1003-WA-122909-DIF	12/29/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WA	155.6	1.78	0.032	0.099	µg/L	
90EW0014	90EW0014-WG-121609	12/16/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	196.8	0.011	0.003	0.01	µg/L	
90EW0015	90EW0015-WG-121609	12/16/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	198.1	0.033	0.003	0.01	µg/L	
90EW0017	90EW0017-WG-121609	12/16/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	195.8	0.188	0.003	0.01	µg/L	
90EW0018	90EW0018-WG-121609	12/16/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	182.27	0.05	0.003	0.01	µg/L	
90EW0019	90EW0019-WG-121609	12/16/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	197.85	0.677	0.003	0.01	µg/L	
90EW0024	90EW0024-WG-122309	12/23/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	159.8	ND	0.003	0.01	µg/L	U
90EW0025	90EW0025-WG-121609	12/16/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	193.74	0.316	0.003	0.01	µg/L	
90EW0026	90EW0026-WG-121609	12/16/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	194.9	0.393	0.003	0.01	µg/L	
90EW0027	90EW0027-WG-121609	12/16/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	175.6	ND	0.003	0.01	µg/L	U
90EW0031	90EW0031-WG-121609	12/16/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	106.53	0.065	0.003	0.01	µg/L	
90EW0031	90EWFD-WG-121609	12/16/2009	E504.1	FD1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	106.53	0.075	0.003	0.01	µg/L	
90MP0060A	90MP0060A-WG-122809	12/28/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	171.77	ND	0.003	0.01	µg/L	U
90MP0060B	90MP0060B-WG-122809	12/28/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	152.27	0.017	0.003	0.01	µg/L	
90MP0060C	90MP0060C-WG-122809	12/28/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	127.77	ND	0.003	0.01	µg/L	U
90MW0027	90MW0027-WG-121809-DIF	12/18/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	165.63	0.017	0.003	0.01	µg/L	
90MW0106A	90MW0106A-WG-121709-DIF	12/17/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	224.92	0.308	0.003	0.01	µg/L	
90MW0106B	90MW0106B-WG-121709-DIF	12/17/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	212.33	9.07	0.031	0.1	µg/L	
90MW0106C	90MW0106C-WG-121709-DIF	12/17/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	192.24	1.2	0.015	0.05	µg/L	
90MW0107A	90MW0107A-WG-121709-DIF	12/17/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	206.9	0.374	0.003	0.01	µg/L	
90MW0107B	90MW0107B-WG-121709-DIF	12/17/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	192.68	BRL	0.003	0.01	µg/L	J
90MW0200B	90MW0200B-WG-121809-DIF	12/18/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	234.59	ND	0.003	0.01	µg/L	U
90MW0200C	90MW0200C-WG-121809-DIF	12/18/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	187.55	1.62	0.016	0.05	µg/L	
90MW0201B	90MW0201B-WG-121809-DIF	12/18/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	202.69	13.2	0.063	0.198	µg/L	
90MW0201C	90MW0201C-WG-121809-DIF	12/18/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	182.54	BRL	0.003	0.01	µg/L	J
90MW0202C	90MW0202C-WG-121809-DIF	12/18/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WG	142.54	0.075	0.003	0.01	µg/L	
90PLT01001	90PLT01001-WW-062409	6/24/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		0.378	0.003	0.01	µg/L	
90PLT01001	90PLT01001-WW-072709	7/27/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		0.472	0.003	0.01	µg/L	
90PLT01001	90PLT01001-WW-082809	8/28/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		0.492	0.003	0.01	µg/L	
90PLT01001	90PLT01001-WW-082809	8/28/2009	SW8260B	N1	1,1,1-TRICHLOROETHANE	WW		ND	0.16	1	µg/L	U
90PLT01001	90PLT01001-WW-082809	8/28/2009	SW8260B	N1	1,1,2,2-TETRACHLOROETHANE	WW		ND	0.14	1	µg/L	U
90PLT01001	90PLT01001-WW-082809	8/28/2009	SW8260B	N1	1,1,2-TRICHLOROETHANE	WW		ND	0.2	1	µg/L	U
90PLT01001	90PLT01001-WW-082809	8/28/2009	SW8260B	N1	1,1-DICHLOROETHANE	WW		ND	0.15	1	µg/L	U
90PLT01001	90PLT01001-WW-082809	8/28/2009	SW8260B	N1	1,1-DICHLOROETHENE	WW		ND	0.17	1	µg/L	U
90PLT01001	90PLT01001-WW-082809	8/28/2009	SW8260B	N1	1,2,4-TRICHLOROBENZENE	WW		ND	0.44	2	µg/L	U
90PLT01001	90PLT01001-WW-082809	8/28/2009	SW8260B	N1	1,2-DIBROMO-3-CHLOROPROPANE	WW		ND	0.53	2	µg/L	U
90PLT01001	90PLT01001-WW-082809	8/28/2009	SW8260B	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		BRL	0.2	1	µg/L	J

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Location	Sample ID	Date	Test	Type	Analyte	Matrix	Depth	Analyte Result	DL	RL	Units	Qual
90PLT01001	90PLT01001-WW-082809	8/28/2009	SW8260B	N1	1,2-DICHLOROBENZENE	WW		ND	0.18	1	µg/L	U
90PLT01001	90PLT01001-WW-082809	8/28/2009	SW8260B	N1	1,2-DICHLOROETHANE	WW		ND	0.15	1	µg/L	U
90PLT01001	90PLT01001-WW-082809	8/28/2009	SW8260B	N1	1,2-DICHLOROPROPANE	WW		ND	0.13	1	µg/L	U
90PLT01001	90PLT01001-WW-082809	8/28/2009	SW8260B	N1	1,3-DICHLOROBENZENE	WW		ND	0.2	1	µg/L	U
90PLT01001	90PLT01001-WW-082809	8/28/2009	SW8260B	N1	1,4-DICHLOROBENZENE	WW		ND	0.21	1	µg/L	U
90PLT01001	90PLT01001-WW-082809	8/28/2009	SW8260B	N1	BENZENE	WW		ND	0.16	1	µg/L	U
90PLT01001	90PLT01001-WW-082809	8/28/2009	SW8260B	N1	BROMOCHLOROMETHANE	WW		ND	0.18	1	µg/L	U
90PLT01001	90PLT01001-WW-082809	8/28/2009	SW8260B	N1	BROMODICHLOROMETHANE	WW		ND	0.16	1	µg/L	U
90PLT01001	90PLT01001-WW-082809	8/28/2009	SW8260B	N1	BROMOFORM	WW		ND	0.22	1	µg/L	U
90PLT01001	90PLT01001-WW-082809	8/28/2009	SW8260B	N1	BROMOMETHANE	WW		ND	0.29	2	µg/L	UJ
90PLT01001	90PLT01001-WW-082809	8/28/2009	SW8260B	N1	CARBON TETRACHLORIDE	WW		ND	0.14	1	µg/L	U
90PLT01001	90PLT01001-WW-082809	8/28/2009	SW8260B	N1	CHLOROBENZENE	WW		ND	0.18	1	µg/L	U
90PLT01001	90PLT01001-WW-082809	8/28/2009	SW8260B	N1	CHLOROETHANE	WW		ND	0.22	1	µg/L	U
90PLT01001	90PLT01001-WW-082809	8/28/2009	SW8260B	N1	CHLOROFORM	WW		BRL	0.15	1	µg/L	J
90PLT01001	90PLT01001-WW-082809	8/28/2009	SW8260B	N1	CHLOROMETHANE	WW		ND	0.37	1	µg/L	U
90PLT01001	90PLT01001-WW-082809	8/28/2009	SW8260B	N1	cis-1,2-DICHLOROETHENE	WW		ND	0.19	1	µg/L	U
90PLT01001	90PLT01001-WW-082809	8/28/2009	SW8260B	N1	cis-1,3-DICHLOROPROPENE	WW		ND	0.14	1	µg/L	U
90PLT01001	90PLT01001-WW-082809	8/28/2009	SW8260B	N1	DIBROMOCHLOROMETHANE	WW		ND	0.16	1	µg/L	U
90PLT01001	90PLT01001-WW-082809	8/28/2009	SW8260B	N1	ETHYLBENZENE	WW		ND	0.17	1	µg/L	U
90PLT01001	90PLT01001-WW-082809	8/28/2009	SW8260B	N1	M,P-XYLENE (SUM OF ISOMERS)	WW		ND	0.33	2	µg/L	U
90PLT01001	90PLT01001-WW-082809	8/28/2009	SW8260B	N1	METHYLENE CHLORIDE	WW		ND	0.57	2	µg/L	U
90PLT01001	90PLT01001-WW-082809	8/28/2009	SW8260B	N1	O-XYLENE (1,2-DIMETHYLBENZENE)	WW		ND	0.33	1	µg/L	U
90PLT01001	90PLT01001-WW-082809	8/28/2009	SW8260B	N1	STYRENE	WW		ND	0.36	1	µg/L	U
90PLT01001	90PLT01001-WW-082809	8/28/2009	SW8260B	N1	tert-BUTYL METHYL ETHER	WW		ND	0.16	1	µg/L	U
90PLT01001	90PLT01001-WW-082809	8/28/2009	SW8260B	N1	TETRACHLOROETHENE (PCE)	WW		ND	0.18	1	µg/L	U
90PLT01001	90PLT01001-WW-082809	8/28/2009	SW8260B	N1	TOLUENE	WW		ND	0.16	1	µg/L	U
90PLT01001	90PLT01001-WW-082809	8/28/2009	SW8260B	N1	trans-1,2-DICHLOROETHENE	WW		ND	0.16	1	µg/L	U
90PLT01001	90PLT01001-WW-082809	8/28/2009	SW8260B	N1	trans-1,3-DICHLOROPROPENE	WW		ND	0.17	1	µg/L	U
90PLT01001	90PLT01001-WW-082809	8/28/2009	SW8260B	N1	TRICHLOROETHENE (TCE)	WW		ND	0.18	1	µg/L	U
90PLT01001	90PLT01001-WW-082809	8/28/2009	SW8260B	N1	VINYL CHLORIDE	WW		ND	0.38	1	µg/L	U
90PLT01001	90PLT01001-WW-092509	9/25/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		0.358	0.003	0.01	µg/L	
90PLT01001	90PLT01001-WW-102709	10/27/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		0.426	0.003	0.01	µg/L	
90PLT01001	90PLT01001-WW-112409	11/24/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		0.421	0.003	0.01	µg/L	
90PLT01001	90PLT01001-WW-112409	11/24/2009	SW8260B	N1	1,1,1-TRICHLOROETHANE	WW		ND	0.16	1	µg/L	U
90PLT01001	90PLT01001-WW-112409	11/24/2009	SW8260B	N1	1,1,2,2-TETRACHLOROETHANE	WW		ND	0.19	1	µg/L	U
90PLT01001	90PLT01001-WW-112409	11/24/2009	SW8260B	N1	1,1,2-TRICHLOROETHANE	WW		ND	0.26	1	µg/L	U
90PLT01001	90PLT01001-WW-112409	11/24/2009	SW8260B	N1	1,1-DICHLOROETHANE	WW		ND	0.22	1	µg/L	U
90PLT01001	90PLT01001-WW-112409	11/24/2009	SW8260B	N1	1,1-DICHLOROETHENE	WW		ND	0.18	1	µg/L	U
90PLT01001	90PLT01001-WW-112409	11/24/2009	SW8260B	N1	1,2,4-TRICHLOROBENZENE	WW		ND	0.22	2	µg/L	U
90PLT01001	90PLT01001-WW-112409	11/24/2009	SW8260B	N1	1,2-DIBROMO-3-CHLOROPROPANE	WW		ND	0.33	2	µg/L	U

**Attachment C-2**  
**Analytical Laboratory Results, June - December 2009**  
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Location	Sample ID	Date	Test	Type	Analyte	Matrix	Depth	Analyte Result	DL	RL	Units	Qual
90PLT01001	90PLT01001-WW-112409	11/24/2009	SW8260B	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		BRL	0.19	1	µg/L	J
90PLT01001	90PLT01001-WW-112409	11/24/2009	SW8260B	N1	1,2-DICHLOROBENZENE	WW		ND	0.18	1	µg/L	U
90PLT01001	90PLT01001-WW-112409	11/24/2009	SW8260B	N1	1,2-DICHLOROETHANE	WW		ND	0.16	1	µg/L	U
90PLT01001	90PLT01001-WW-112409	11/24/2009	SW8260B	N1	1,2-DICHLOROPROPANE	WW		ND	0.3	1	µg/L	U
90PLT01001	90PLT01001-WW-112409	11/24/2009	SW8260B	N1	1,3-DICHLOROBENZENE	WW		ND	0.19	1	µg/L	U
90PLT01001	90PLT01001-WW-112409	11/24/2009	SW8260B	N1	1,4-DICHLOROBENZENE	WW		ND	0.22	1	µg/L	U
90PLT01001	90PLT01001-WW-112409	11/24/2009	SW8260B	N1	BENZENE	WW		ND	0.19	1	µg/L	U
90PLT01001	90PLT01001-WW-112409	11/24/2009	SW8260B	N1	BROMOCHLOROMETHANE	WW		ND	0.33	1	µg/L	U
90PLT01001	90PLT01001-WW-112409	11/24/2009	SW8260B	N1	BROMODICHLOROMETHANE	WW		ND	0.19	1	µg/L	U
90PLT01001	90PLT01001-WW-112409	11/24/2009	SW8260B	N1	BROMOFORM	WW		ND	0.25	1	µg/L	U
90PLT01001	90PLT01001-WW-112409	11/24/2009	SW8260B	N1	BROMOMETHANE	WW		ND	0.26	2	µg/L	U
90PLT01001	90PLT01001-WW-112409	11/24/2009	SW8260B	N1	CARBON TETRACHLORIDE	WW		ND	0.16	1	µg/L	U
90PLT01001	90PLT01001-WW-112409	11/24/2009	SW8260B	N1	CHLOROBENZENE	WW		ND	0.19	1	µg/L	U
90PLT01001	90PLT01001-WW-112409	11/24/2009	SW8260B	N1	CHLOROETHANE	WW		ND	0.23	1	µg/L	U
90PLT01001	90PLT01001-WW-112409	11/24/2009	SW8260B	N1	CHLOROFORM	WW		BRL	0.2	1	µg/L	J
90PLT01001	90PLT01001-WW-112409	11/24/2009	SW8260B	N1	CHLOROMETHANE	WW		ND	0.28	1	µg/L	U
90PLT01001	90PLT01001-WW-112409	11/24/2009	SW8260B	N1	cis-1,2-DICHLOROETHENE	WW		ND	0.19	1	µg/L	U
90PLT01001	90PLT01001-WW-112409	11/24/2009	SW8260B	N1	cis-1,3-DICHLOROPROPENE	WW		ND	0.14	1	µg/L	U
90PLT01001	90PLT01001-WW-112409	11/24/2009	SW8260B	N1	DIBROMOCHLOROMETHANE	WW		ND	0.19	1	µg/L	U
90PLT01001	90PLT01001-WW-112409	11/24/2009	SW8260B	N1	ETHYLBENZENE	WW		ND	0.26	1	µg/L	U
90PLT01001	90PLT01001-WW-112409	11/24/2009	SW8260B	N1	M,P-XYLENE (SUM OF ISOMERS)	WW		ND	0.35	2	µg/L	U
90PLT01001	90PLT01001-WW-112409	11/24/2009	SW8260B	N1	METHYLENE CHLORIDE	WW		ND	0.54	2	µg/L	U
90PLT01001	90PLT01001-WW-112409	11/24/2009	SW8260B	N1	O-XYLENE (1,2-DIMETHYLBENZENE)	WW		ND	0.33	1	µg/L	U
90PLT01001	90PLT01001-WW-112409	11/24/2009	SW8260B	N1	STYRENE	WW		ND	0.36	1	µg/L	U
90PLT01001	90PLT01001-WW-112409	11/24/2009	SW8260B	N1	tert-BUTYL METHYL ETHER	WW		ND	0.16	1	µg/L	U
90PLT01001	90PLT01001-WW-112409	11/24/2009	SW8260B	N1	TETRACHLOROETHENE (PCE)	WW		ND	0.18	1	µg/L	U
90PLT01001	90PLT01001-WW-112409	11/24/2009	SW8260B	N1	TOLUENE	WW		ND	0.23	1	µg/L	U
90PLT01001	90PLT01001-WW-112409	11/24/2009	SW8260B	N1	trans-1,2-DICHLOROETHENE	WW		ND	0.21	1	µg/L	U
90PLT01001	90PLT01001-WW-112409	11/24/2009	SW8260B	N1	trans-1,3-DICHLOROPROPENE	WW		ND	0.16	1	µg/L	U
90PLT01001	90PLT01001-WW-112409	11/24/2009	SW8260B	N1	TRICHLOROETHENE (TCE)	WW		ND	0.17	1	µg/L	U
90PLT01001	90PLT01001-WW-112409	11/24/2009	SW8260B	N1	VINYL CHLORIDE	WW		ND	0.22	1	µg/L	U
90PLT01001	90PLT01001-WW-123009	12/30/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		0.374	0.003	0.01	µg/L	
90PLT01023	90PLT01023-WW-062409	6/24/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		ND	0.003	0.01	µg/L	U
90PLT01023	90PLT01023-WW-072709	7/27/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		ND	0.003	0.01	µg/L	U
90PLT01023	90PLT01023-WW-082809	8/28/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		0.011	0.003	0.01	µg/L	J
90PLT01023	90PLT01023-WW-092509	9/25/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		0.016	0.003	0.01	µg/L	
90PLT01024	90PLT01024-WW-102709	10/27/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		ND	0.003	0.01	µg/L	U
90PLT01024	90PLT01024-WW-112409	11/24/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		ND	0.003	0.01	µg/L	U
90PLT01024	90PLT01024-WW-123009	12/30/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		ND	0.003	0.01	µg/L	U
90PLT01033	90PLT01033-WW-062409	6/24/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		ND	0.003	0.01	µg/L	U

**Attachment C-2**  
**Analytical Laboratory Results, June - December 2009**  
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Location	Sample ID	Date	Test	Type	Analyte	Matrix	Depth	Analyte Result	DL	RL	Units	Qual
90PLT01033	90PLT01033-WW-072709	7/27/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		ND	0.003	0.01	µg/L	U
90PLT01033	90PLT01033-WW-082809	8/28/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		ND	0.003	0.01	µg/L	U
90PLT01033	90PLT01033-WW-092509	9/25/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		ND	0.003	0.01	µg/L	U
90PLT01033	90PLT01033-WW-102709	10/27/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		BRL	0.003	0.01	µg/L	J
90PLT01033	90PLT01033-WW-112409	11/24/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		ND	0.003	0.01	µg/L	U
90PLT01033	90PLT01033-WW-123009	12/30/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		ND	0.003	0.01	µg/L	U
90PLT01041	90PLT01041-WW-062409	6/24/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		ND	0.003	0.01	µg/L	U
90PLT01041	90PLT01041-WW-072709	7/27/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		ND	0.003	0.01	µg/L	U
90PLT01041	90PLT01041-WW-082809	8/28/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		ND	0.003	0.01	µg/L	U
90PLT01041	90PLT01041-WW-092509	9/25/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		ND	0.003	0.01	µg/L	U
90PLT01041	90PLT01041-WW-102709	10/27/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		ND	0.003	0.01	µg/L	U
90PLT01041	90PLT01041-WW-112409	11/24/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		ND	0.003	0.01	µg/L	U
90PLT01041	90PLT01041-WW-123009	12/30/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		ND	0.003	0.01	µg/L	U
90PLT01053	90PLT01053-WW-060209	6/2/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		ND	0.003	0.01	µg/L	U
90PLT01053	90PLT01053-WW-062409	6/24/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		ND	0.003	0.01	µg/L	U
90PLT01053	90PLT01053-WW-072709	7/27/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		ND	0.003	0.01	µg/L	U
90PLT01053	90PLT01053-WW-082809	8/28/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		ND	0.003	0.01	µg/L	U
90PLT01053	90PLT01053-WW-082809	8/28/2009	SW8260B	N1	1,1,1-TRICHLOROETHANE	WW		ND	0.16	1	µg/L	U
90PLT01053	90PLT01053-WW-082809	8/28/2009	SW8260B	N1	1,1,2,2-TETRACHLOROETHANE	WW		ND	0.14	1	µg/L	U
90PLT01053	90PLT01053-WW-082809	8/28/2009	SW8260B	N1	1,1,2-TRICHLOROETHANE	WW		ND	0.2	1	µg/L	U
90PLT01053	90PLT01053-WW-082809	8/28/2009	SW8260B	N1	1,1-DICHLOROETHANE	WW		ND	0.15	1	µg/L	U
90PLT01053	90PLT01053-WW-082809	8/28/2009	SW8260B	N1	1,1-DICHLOROETHENE	WW		ND	0.17	1	µg/L	U
90PLT01053	90PLT01053-WW-082809	8/28/2009	SW8260B	N1	1,2,4-TRICHLOROETHANE	WW		ND	0.44	2	µg/L	U
90PLT01053	90PLT01053-WW-082809	8/28/2009	SW8260B	N1	1,2-DIBROMO-3-CHLOROPROPANE	WW		ND	0.53	2	µg/L	U
90PLT01053	90PLT01053-WW-082809	8/28/2009	SW8260B	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		ND	0.2	1	µg/L	U
90PLT01053	90PLT01053-WW-082809	8/28/2009	SW8260B	N1	1,2-DICHLOROBENZENE	WW		ND	0.18	1	µg/L	U
90PLT01053	90PLT01053-WW-082809	8/28/2009	SW8260B	N1	1,2-DICHLOROETHANE	WW		ND	0.15	1	µg/L	U
90PLT01053	90PLT01053-WW-082809	8/28/2009	SW8260B	N1	1,2-DICHLOROPROPANE	WW		ND	0.13	1	µg/L	U
90PLT01053	90PLT01053-WW-082809	8/28/2009	SW8260B	N1	1,3-DICHLOROBENZENE	WW		ND	0.2	1	µg/L	U
90PLT01053	90PLT01053-WW-082809	8/28/2009	SW8260B	N1	1,4-DICHLOROBENZENE	WW		ND	0.21	1	µg/L	U
90PLT01053	90PLT01053-WW-082809	8/28/2009	SW8260B	N1	BENZENE	WW		ND	0.16	1	µg/L	U
90PLT01053	90PLT01053-WW-082809	8/28/2009	SW8260B	N1	BROMOCHLOROMETHANE	WW		ND	0.18	1	µg/L	U
90PLT01053	90PLT01053-WW-082809	8/28/2009	SW8260B	N1	BROMODICHLOROMETHANE	WW		ND	0.16	1	µg/L	U
90PLT01053	90PLT01053-WW-082809	8/28/2009	SW8260B	N1	BROMOFORM	WW		ND	0.22	1	µg/L	U
90PLT01053	90PLT01053-WW-082809	8/28/2009	SW8260B	N1	BROMOMETHANE	WW		ND	0.29	2	µg/L	UJ
90PLT01053	90PLT01053-WW-082809	8/28/2009	SW8260B	N1	CARBON TETRACHLORIDE	WW		ND	0.14	1	µg/L	U
90PLT01053	90PLT01053-WW-082809	8/28/2009	SW8260B	N1	CHLOROBENZENE	WW		ND	0.18	1	µg/L	U
90PLT01053	90PLT01053-WW-082809	8/28/2009	SW8260B	N1	CHLOROETHANE	WW		ND	0.22	1	µg/L	U
90PLT01053	90PLT01053-WW-082809	8/28/2009	SW8260B	N1	CHLOROFORM	WW		1.1	0.15	1	µg/L	
90PLT01053	90PLT01053-WW-082809	8/28/2009	SW8260B	N1	CHLOROMETHANE	WW		ND	0.37	1	µg/L	U

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Location	Sample ID	Date	Test	Type	Analyte	Matrix	Depth	Analyte Result	DL	RL	Units	Qual
90PLT01053	90PLT01053-WW-082809	8/28/2009	SW8260B	N1	cis-1,2-DICHLOROETHENE	WW		ND	0.19	1	µg/L	U
90PLT01053	90PLT01053-WW-082809	8/28/2009	SW8260B	N1	cis-1,3-DICHLOROPROPENE	WW		ND	0.14	1	µg/L	U
90PLT01053	90PLT01053-WW-082809	8/28/2009	SW8260B	N1	DIBROMOCHLOROMETHANE	WW		ND	0.16	1	µg/L	U
90PLT01053	90PLT01053-WW-082809	8/28/2009	SW8260B	N1	ETHYLBENZENE	WW		ND	0.17	1	µg/L	U
90PLT01053	90PLT01053-WW-082809	8/28/2009	SW8260B	N1	M,P-XYLENE (SUM OF ISOMERS)	WW		ND	0.33	2	µg/L	U
90PLT01053	90PLT01053-WW-082809	8/28/2009	SW8260B	N1	METHYLENE CHLORIDE	WW		ND	0.57	2	µg/L	U
90PLT01053	90PLT01053-WW-082809	8/28/2009	SW8260B	N1	O-XYLENE (1,2-DIMETHYLBENZENE)	WW		ND	0.33	1	µg/L	U
90PLT01053	90PLT01053-WW-082809	8/28/2009	SW8260B	N1	STYRENE	WW		ND	0.36	1	µg/L	U
90PLT01053	90PLT01053-WW-082809	8/28/2009	SW8260B	N1	tert-BUTYL METHYL ETHER	WW		ND	0.16	1	µg/L	U
90PLT01053	90PLT01053-WW-082809	8/28/2009	SW8260B	N1	TETRACHLOROETHENE (PCE)	WW		ND	0.18	1	µg/L	U
90PLT01053	90PLT01053-WW-082809	8/28/2009	SW8260B	N1	TOLUENE	WW		ND	0.16	1	µg/L	U
90PLT01053	90PLT01053-WW-082809	8/28/2009	SW8260B	N1	trans-1,2-DICHLOROETHENE	WW		ND	0.16	1	µg/L	U
90PLT01053	90PLT01053-WW-082809	8/28/2009	SW8260B	N1	trans-1,3-DICHLOROPROPENE	WW		ND	0.17	1	µg/L	U
90PLT01053	90PLT01053-WW-082809	8/28/2009	SW8260B	N1	TRICHLOROETHENE (TCE)	WW		ND	0.18	1	µg/L	U
90PLT01053	90PLT01053-WW-082809	8/28/2009	SW8260B	N1	VINYL CHLORIDE	WW		ND	0.38	1	µg/L	U
90PLT01053	90PLT01053-WW-092509	9/25/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		ND	0.003	0.01	µg/L	U
90PLT01053	90PLT01053-WW-102709	10/27/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		ND	0.003	0.01	µg/L	U
90PLT01053	90PLT01053-WW-112409	11/24/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		ND	0.003	0.01	µg/L	U
90PLT01053	90PLT01053-WW-112409	11/24/2009	SW8260B	N1	1,1,1-TRICHLOROETHANE	WW		ND	0.16	1	µg/L	U
90PLT01053	90PLT01053-WW-112409	11/24/2009	SW8260B	N1	1,1,2,2-TETRACHLOROETHANE	WW		ND	0.19	1	µg/L	U
90PLT01053	90PLT01053-WW-112409	11/24/2009	SW8260B	N1	1,1,2-TRICHLOROETHANE	WW		ND	0.26	1	µg/L	U
90PLT01053	90PLT01053-WW-112409	11/24/2009	SW8260B	N1	1,1-DICHLOROETHANE	WW		ND	0.22	1	µg/L	U
90PLT01053	90PLT01053-WW-112409	11/24/2009	SW8260B	N1	1,1-DICHLOROETHENE	WW		ND	0.18	1	µg/L	U
90PLT01053	90PLT01053-WW-112409	11/24/2009	SW8260B	N1	1,2,4-TRICHLOROBENZENE	WW		ND	0.22	2	µg/L	U
90PLT01053	90PLT01053-WW-112409	11/24/2009	SW8260B	N1	1,2-DIBROMO-3-CHLOROPROPANE	WW		ND	0.33	2	µg/L	U
90PLT01053	90PLT01053-WW-112409	11/24/2009	SW8260B	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		ND	0.19	1	µg/L	U
90PLT01053	90PLT01053-WW-112409	11/24/2009	SW8260B	N1	1,2-DICHLOROBENZENE	WW		ND	0.18	1	µg/L	U
90PLT01053	90PLT01053-WW-112409	11/24/2009	SW8260B	N1	1,2-DICHLOROETHANE	WW		ND	0.16	1	µg/L	U
90PLT01053	90PLT01053-WW-112409	11/24/2009	SW8260B	N1	1,2-DICHLOROPROPANE	WW		ND	0.3	1	µg/L	U
90PLT01053	90PLT01053-WW-112409	11/24/2009	SW8260B	N1	1,3-DICHLOROBENZENE	WW		ND	0.19	1	µg/L	U
90PLT01053	90PLT01053-WW-112409	11/24/2009	SW8260B	N1	1,4-DICHLOROBENZENE	WW		ND	0.22	1	µg/L	U
90PLT01053	90PLT01053-WW-112409	11/24/2009	SW8260B	N1	BENZENE	WW		ND	0.19	1	µg/L	U
90PLT01053	90PLT01053-WW-112409	11/24/2009	SW8260B	N1	BROMOCHLOROMETHANE	WW		ND	0.33	1	µg/L	U
90PLT01053	90PLT01053-WW-112409	11/24/2009	SW8260B	N1	BROMODICHLOROMETHANE	WW		ND	0.19	1	µg/L	U
90PLT01053	90PLT01053-WW-112409	11/24/2009	SW8260B	N1	BROMOFORM	WW		ND	0.25	1	µg/L	U
90PLT01053	90PLT01053-WW-112409	11/24/2009	SW8260B	N1	BROMOMETHANE	WW		ND	0.26	2	µg/L	U
90PLT01053	90PLT01053-WW-112409	11/24/2009	SW8260B	N1	CARBON TETRACHLORIDE	WW		ND	0.16	1	µg/L	U
90PLT01053	90PLT01053-WW-112409	11/24/2009	SW8260B	N1	CHLOROBENZENE	WW		ND	0.19	1	µg/L	U
90PLT01053	90PLT01053-WW-112409	11/24/2009	SW8260B	N1	CHLOROETHANE	WW		ND	0.23	1	µg/L	U
90PLT01053	90PLT01053-WW-112409	11/24/2009	SW8260B	N1	CHLOROFORM	WW		1.2	0.2	1	µg/L	



**Attachment C-2**  
**Analytical Laboratory Results, June - December 2009**  
**FS-12 2009 Summary Letter Report**

Location	Sample ID	Date	Test	Type	Analyte	Matrix	Depth	Analyte Result	DL	RL	Units	Qual
90PLT01053	90PLT01053-WW-112409	11/24/2009	SW8260B	N1	CHLOROMETHANE	WW		ND	0.28	1	µg/L	U
90PLT01053	90PLT01053-WW-112409	11/24/2009	SW8260B	N1	cis-1,2-DICHLOROETHENE	WW		ND	0.19	1	µg/L	U
90PLT01053	90PLT01053-WW-112409	11/24/2009	SW8260B	N1	cis-1,3-DICHLOROPROPENE	WW		ND	0.14	1	µg/L	U
90PLT01053	90PLT01053-WW-112409	11/24/2009	SW8260B	N1	DIBROMOCHLOROMETHANE	WW		ND	0.19	1	µg/L	U
90PLT01053	90PLT01053-WW-112409	11/24/2009	SW8260B	N1	ETHYLBENZENE	WW		ND	0.26	1	µg/L	U
90PLT01053	90PLT01053-WW-112409	11/24/2009	SW8260B	N1	M,P-XYLENE (SUM OF ISOMERS)	WW		ND	0.35	2	µg/L	U
90PLT01053	90PLT01053-WW-112409	11/24/2009	SW8260B	N1	METHYLENE CHLORIDE	WW		ND	0.54	2	µg/L	U
90PLT01053	90PLT01053-WW-112409	11/24/2009	SW8260B	N1	O-XYLENE (1,2-DIMETHYLBENZENE)	WW		ND	0.33	1	µg/L	U
90PLT01053	90PLT01053-WW-112409	11/24/2009	SW8260B	N1	STYRENE	WW		ND	0.36	1	µg/L	U
90PLT01053	90PLT01053-WW-112409	11/24/2009	SW8260B	N1	tert-BUTYL METHYL ETHER	WW		ND	0.16	1	µg/L	U
90PLT01053	90PLT01053-WW-112409	11/24/2009	SW8260B	N1	TETRACHLOROETHENE (PCE)	WW		ND	0.18	1	µg/L	U
90PLT01053	90PLT01053-WW-112409	11/24/2009	SW8260B	N1	TOLUENE	WW		ND	0.23	1	µg/L	U
90PLT01053	90PLT01053-WW-112409	11/24/2009	SW8260B	N1	trans-1,2-DICHLOROETHENE	WW		ND	0.21	1	µg/L	U
90PLT01053	90PLT01053-WW-112409	11/24/2009	SW8260B	N1	trans-1,3-DICHLOROPROPENE	WW		ND	0.16	1	µg/L	U
90PLT01053	90PLT01053-WW-112409	11/24/2009	SW8260B	N1	TRICHLOROETHENE (TCE)	WW		ND	0.17	1	µg/L	U
90PLT01053	90PLT01053-WW-112409	11/24/2009	SW8260B	N1	VINYL CHLORIDE	WW		ND	0.22	1	µg/L	U
90PLT01053	90PLT01053-WW-123009	12/30/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WW		ND	0.003	0.01	µg/L	U
90SW0001	90SW0001-SW-071309	7/13/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WS		ND	0.003	0.01	µg/L	U
90SW0002	90SW0002-SW-071309	7/13/2009	E504.1	N1	1,2-DIBROMOETHANE (ETHYLENE DIBROMIDE)	WS		ND	0.003	0.01	µg/L	U

Data Source: AFCEE, February 2010, MMR-AFCEE Data Warehouse

Key:

BRL = below reporting limit	U = undetected
DL = detection limit	UJ = estimated undetection
FD1 = field duplicate	WA = drill cuttings, aqueous matrix
J = estimated value	WG = groundwater
ND = nondetect	WS = surface water
N1 = native sample	WW = wastewater
RL = reporting limit	µg/L = micrograms per liter

October 20, 2009

To: Rose Forbes, AFCEE

From: Robert Bogert, HGL Project Manager  
Ken Rapuano, HGL Senior Chemist  
Matt Beaupre, Alpha Project Manager  
Scott Enright, Alpha Senior Chemist  
Jim Todaro, Alpha QA Manager

RE: Method 504.1 for 1,2-dibromoethane (EDB): Results not reported to the  
Method Detection Limit (MDL)

---

Alpha Analytical Laboratories (Alpha) conducted a method detection limit (MDL) study in May 2009 prior to receiving samples for analysis by Method 504.1 for 1,2-dibromoethane (EDB). The MDL derived from this study was 0.0032 ug/L (Column A) and 0.0031 ug/L (Column B). These MDL values are sufficiently low to support the EDB reporting limit (RL) of 0.01 ug/L that is required for this project. Both columns are considered to have equal quantitative significance. The project-specific RL was established at 0.01 ug/L. Alpha's routine EDB RL is 0.02 ug/L, and this lower RL was confirmed by the addition of an initial calibration standard at 0.01 ug/L. Detected results should be reported down to the derived column-specific MDLs, unless instructed otherwise, using J qualifiers for results quantitated below the RL.

### ***Summary of Problem***

The EDB results presented in the Alpha data reports from June through August were compared against historical values by CH2M HILL. Historical data for samples for specific sample locations previously indicated routine detections between the RL and MDL whereas the recent data were reported as non-detect (ND). HGL reviewed the chromatograms for a selected project data package, and confirmed EDB peaks were evident for two of the reviewed samples chromatograms for which the reported EDB result was ND. The laboratory was contacted, and acknowledged that the observed peaks were EDB detections that were below the RL and that the data were not properly being reported to the MDL. All laboratory reports for EDB required review to determine if other low level detections were not reported.

### ***Contributing Factors***

Human error by Alpha's bench chemist was the cause of the problem. Prior to conducting the May 2009 MDL study, Alpha's standard RL for 504.1 analysis was 0.020 ug/L. This was also the lowest point of Alpha's standard five-point calibration. Alpha did incorporate a sixth calibration standard of 0.01 ug/L to meet the project required reporting level; however, the analyst failed to take this into account when evaluating the raw data and thus reported the results as if a 0.02 ug/L calibration

point was the lowest available. Since the results for certain samples that Alpha reported as ND were below the typical calibration point, the results were incorrectly reported as ND. This occurred despite communication at the beginning of the project between the laboratory manager and the analyst. This error was not detected by the laboratory quality control review, because the information necessary to correct a false-negative is not available during the normal review process. Similarly, the false-negative could not be caught during data validation without a Level IV review. The error was detected upon comparing current data with historic results. Historic data showed routine detections above the MDL but below the RL for certain locations that were currently being reported as ND. The comparison of current data with historical data prompted further review of all EDB lab reports prepared by Alpha.

### ***Corrective Action***

All prior lab reports have been re-evaluated to verify if previously reported ND values for EDB (i.e., results reported as “0.01 U”) should have been reported as detected values above the MDL but below the RL. The project team, including the laboratory manager and QA manager, were informed that the correct reporting conventions for low-level detections (below the RL) must be implemented for all previously released reports. Revised reports have been reissued. Pending final review by HGL, the electronic data will be corrected. Table 1 presents a summary of the changes that were made based upon report review..

### ***Preventative Action***

Alpha will perform a greater level of quality control in reviewing the chromatograms prior to reporting data to ensure that the data reporting conventions have been correctly implemented in the reporting of EDB results. As a final check, HGL will review the chromatograms for all ND results (revised reports and future reports) to screen for possible detections that are not being reported. Alpha has adopted the MMR project specific RL and associated MDL from the May 2009 study as the laboratory standard RL and MDL. This change will minimize the potential for false-negatives due to human error.

### ***Current Status***

Laboratory reports have been reviewed by Alpha and transmitted to HGL. HGL performed a secondary review on all EDB results to verify that no other corrections were required. During the review HGL found one additional sample that was improperly reported as ND (L0908388-03). The results for this sample have also been corrected. HGL has forwarded the revised results to AFCEE and CH2M HILL. The data corrections are summarized in Table 1.

Table 1  
Corrected EDB Results by Method 504.1

SDG	Sample No.	Sample ID	Result <sup>1</sup>	Flag	RFS	Task	Description	Project Impact
L0907370	-01	69MW0033A-GW-060509	0.003	J	25	LTM	FS-28 Baseline sampling of new wells	Result reported as ND in 16 September 2009 Data Presentation to regulators. Low detection at this location does not affect the decision making process; recommended that the incorrect data reporting should be noted in the Project Note.
L0907640	-01	36EW0001-GW-061009	0.012		50	LTM	FS-1 Triennial	Data has not been reported to regulators; value was used to calculate mass removal estimates, but impact is negligible.
L0908388	-03	36MW1043B-GW-062309	0.028		50	LTM	FS-1 Triennial	Data has not been reported to regulators; impact is negligible.
L0908388	-07	36MW1036C-GW-062309	0.011		50	LTM	FS-1 Triennial	Data has not been reported to regulators; impact is negligible.
L0908634	-05	36MW1003AGW062609	0.004	J	50	LTM	FS-1 Triennial	Data has not been reported to regulators; impact is negligible.
L0908634	-06	36MW0131AGW062609	0.006	J	50	LTM	FS-1 Triennial	Data has not been reported to regulators; impact is negligible.
L0908696	-15	69MW1279CGW070109 <sup>2</sup>	0.006	J	1	LTM	Connamasset Water Supply Well Sentry Well*	No impact. Result is below the RL, and results below the RL should not be reported.
L0909083	-03	36SW0019-SW-070709	0.0055	JP	17	LTM	FS-1 2nd Seasonal SW	No impact - The Quashnet bogs are not in production. The data is not needed to assess marketability of the cranberry crop.
L0910367	-03	27EW0002-GW-072909	0.008	J	12	LTM	LF-1 Q-SA EW	Data was not reported to regulators yet; value was used to calculate mass removal estimates, but impact is negligible.
L0912057	-15	36PLT02003-WW-082809	0.011		92	O&M	FS-1 Monthly Plant Sampling	Carbon change-out was implemented one-month late based on O&M protocol. However, there was no impact since effluent discharge criteria are still being met.
L0912057	-19	69PLT01002-WW-082809	0.0055	J	91	O&M	FS-28 Monthly Plant Sampling	The FS-28 plant was resampled out of normal cycle, based on historical patterns versus actual results. While the results (0.0055 J ug/L) from the sample collected on 28AUG09 would not have prompted a carbon-change out, the results (0.011 ug/L) of the resampling conducted 20 days later (17SEP09) did show the need for a carbon exchange. Effluent discharge criteria were met.
L0912058	-05	90PLT01023-WW-082809	0.011		102	O&M	FS-12 Treatment Facility Monthly Plant Sampling	Carbon change-out was implemented one-month late based on O&M protocol. However, there was no impact since effluent discharge criteria are still being met.

1. All previous data were reported as Non-Detect (ND). The results below reflect the corrected values based on review of the lab reports. All results are reported in ug/L.

2. Denotes ResWell Report requested. Result was reported as ND since it is below the RL of 0.01. A revised report has not issued.

-----Original Message-----

From: marchessault.paul@epamail.epa.gov  
[mailto:marchessault.paul@epamail.epa.gov]  
Sent: Friday, October 30, 2009 3:27 PM  
To: Forbes, Rose Civ USAF AFCEE AFCEE/MMR  
Cc: Len Pinaud; Elliot.Jacobs@state.ma.us; Davis, Jon Civ USAF AFCEE AFCEE/MMR; Minior, Mike Civ USAF AFCEE AFCEE/MMR  
Subject: Re: HGL Review of EDB Data Packages - Corrective Action Report

Hi Rose,

I sent this information to Steve DiMattei, and here is his response:

"Looks pretty straight forward to me. Everything included in this memo looks plausible, and there is nothing here that would make me believe that something different happened. In summary, what I get from the memo is that the lab made a mistake by not reporting down to a lower detection limit (due to a lack of internal lab communication), HGL caught the mistake, and the lab admitted that they made a mistake. The lab went back and has corrected the data that was reported "ND" due to an incorrect reporting limit, and now has a plan in place to hopefully stop it from happening again".

Hope that answers your question. Have a great weekend.

Paul N. Marchessault, Remedial Project Manager Federal Facilities Superfund Section  
1 Congress Street, Suite 1100  
Boston, MA 02114  
Phone: (617) 918-1388  
Fax: (617) 918-1291

-----"Forbes, Rose Civ USAF AFCEE AFCEE/MMR" <Rose.Forbes@brooks.af.mil> wrote: -----

To: Paul Marchessault/R1/USEPA/US@EPA, "Len Pinaud"  
<leonard.pinaud@state.ma.us>, <Elliot.Jacobs@state.ma.us>  
From: "Forbes, Rose Civ USAF AFCEE AFCEE/MMR"  
<Rose.Forbes@brooks.af.mil>  
Date: 10/29/2009 08:34AM  
cc: "Davis, Jon Civ USAF AFCEE AFCEE/MMR" <Jon.Davis@brooks.af.mil>, "Minior, Mike Civ USAF AFCEE AFCEE/MMR" <Mike.Minior@brooks.af.mil>  
Subject: HGL Review of EDB Data Packages - Corrective Action Report

If you recall during the O&M/SPEIM update I gave at the last RPM meeting, I mentioned there were issues with reporting some 504.1 results from Alpha Analytical Lab. The analytical work was performed correctly but there was a mistake in the way the chemist reported some results. The attached corrective action report describes the issue and subsequent response in more detail and also provides a table of the impacted results.

Please let me know if you have any questions or require additional information.

Thanks

Rose


Rose Forbes, P.E.  
HQ AFCEE/MMR  
322 East Inner Road  
Otis ANG Base MA 02542  
Work: 508-968-4670 x 5613  
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[attachment "504 1 EDB Corrective Action\_Final.pdf" removed by Paul Marchessault/R1/USEPA/US]

# **ATTACHMENT D**

## **FS-12 Project Note**


**FS-12 2008 Semiannual SPEIM Data Presentation  
(June 2008 through January 2009) and Hydraulic Capture Zone Analysis**  
**[389849-SPEIM-FS12-PRJNOT-001](#)**

  <b>AFCEE</b> <b>SPEIM/LTM/O&amp;M</b> <b>Otis ANG Base, Massachusetts</b> <b>Contract FA8903-08-D-8769-0148</b>	<b>PROJECT NOTE</b>		TASK ORDER 0148
	DOCUMENT CONTROL NUMBER: <b>389849-SPEIM-FS12-PRJNOT-001</b>		PROJECT NO. 389849
	CDRL A001I		PAGE 1 OF 4

Confirmation Of: <input type="checkbox"/> Meeting <input type="checkbox"/> Change Notice <input checked="" type="checkbox"/> General Project Note	Date Held: 08 April 2009 Location: Date Issued: 14 July 2009 Recorded By: Mark Hilyard
Subject: <b>FS-12 2008 SEMIANNUAL SPEIM DATA PRESENTATION          (JUNE 2008 THROUGH JANUARY 2009) AND HYDRAULIC          CAPTURE ZONE ANALYSIS</b>	Issued By: Nigel Tindall  CH2M HILL TECHNICAL SERVICES GROUP MANAGER


ITEM	REMARKS
<b>1.0</b>	<b>INTRODUCTION</b>  <p>This project note summarizes the Fuel Spill-12 (FS-12) 2008 semiannual data presentation for data collected under the FS-12 System Performance and Ecological Impact Monitoring (SPEIM) program between June 2008 and January 2009. In addition, this presentation includes the results of a hydraulic capture zone analysis completed at FS-12 after the optimized pumping configuration (2008 Scenario 01) was implemented. The data presented includes results from the following sampling events:</p> <ul style="list-style-type: none"> <li>• Post-optimization sampling of 90EW0019 (September 2008)</li> <li>• Semiannual sampling of 20 monitoring wells and six non-operational extraction wells (December 2008/January 2009)</li> <li>• Semiannual sampling of four operating extraction wells (December 2008)</li> <li>• Monthly sampling of treatment plant influent (June 2008 through December 2008)</li> <li>• Synoptic groundwater level survey (30 October 2009).</li> </ul> <p>A summary of the data from these sampling events was presented to the regulatory agencies during the 08 April 2009 Technical Update meeting. The handouts for the presentation included six figures and presentation text slides. The data presentation is included as Attachment A.</p>
<b>2.0</b>	<b>BACKGROUND</b>  <p>The FS-12 plume is defined by groundwater contaminated with ethylene dibromide (EDB) at concentrations above the Massachusetts Maximum Contaminant Level (MMCL) of 0.02 micrograms per liter (µg/L). Benzene is also a contaminant of concern at FS-12; however, this compound has not been detected in the FS-12 monitoring network at concentrations above the Maximum Contaminant Level (MCL) of 5 µg/L since 2006. The FS-12 plume is being remediated through the operation of the FS-12 extraction, treatment, and reinjection (ETR) system. During this reporting period, the ETR system operated using pumping configuration 2006 Scenario 01 (10 operating extraction wells; total flow rate of 545 gallons per minute [gpm]) through 10 July 2008. After that date, the ETR system was optimized to pumping configuration 2008 Scenario 01 (four operating extraction wells; total flow rate of 360 gpm) (AFCEE 2008b).</p>

Distribution: AFCEE: Rose Forbes, Jon Davis, Bob Power, Admin. Record; EPA: Paul Marchessault, Bob Lim; MassDEP: Len Pinaud, Elliott Jacobs; CH2M HILL: Pat de Groot, Nigel Tindall, Mark Hilyard, Doc. Control


	<b>PROJECT NOTE</b>	TASK ORDER 0148
		PROJECT NO. 389849
<b>AFCEE</b> <b>SPEIM/LTM/O&amp;M</b> <b>Otis ANG Base, Massachusetts</b> <b>Contract FA8903-08-D-8769-0148</b>	<b>DOCUMENT CONTROL NUMBER:</b> <b>389849-SPEIM-FS12-PRJNOT-001</b>  <b>CDRL A0011</b>	PAGE 2 OF 4

ITEM	REMARKS
	<p>Analytical data for the FS-12 plume have been collected through the SPEIM program since system startup in 1997. This program was developed to monitor plume changes and to ensure the effective operation of the groundwater remediation systems; monitoring networks are also evaluated and optimized through the SPEIM program. The current approved FS-12 SPEIM monitoring network, including analytical scope and methods, is presented in the <i>Comprehensive Long Term Monitoring Plan</i>, which is available on-line at <a href="http://www.mmr.org">www.mmr.org</a> under Plans and protocols.</p> <p>A synoptic water level measurement event was completed in October 2008, approximately three months after the current pumping configuration (2008 Scenario 01) was implemented. Groundwater elevation data collected during this synoptic event were used along with the FS-12 groundwater model (AFCEE 2005) to evaluate the ability of the FS-12 groundwater model to simulate aquifer responses to pumping, and also estimate the actual extent of the FS-12 ETR system hydraulic capture zone, which was previously simulated with the FS-12 groundwater model during the technical evaluation of the FS-12 ETR system optimization (AFCEE 2008b). The hydraulic capture zone analysis was achieved using the three-dimensional (3-D) Residual Analysis Method (RAM) technique which is described in more detail in <i>Final Chemical Spill-10 2007 Southern Trench Technical Memorandum</i> (AFCEE 2008a).</p> <p>The first step of the RAM is to calculate the difference between simulated and measured water levels (simulation residual) at each synoptic monitoring location (Table 1). The residuals are distributed to the 3-D flow model grid by Laplace interpolation. The distributed residuals are then subtracted from the simulated head solution to generate an amended (best estimate) head field that agrees closely with the measured water levels while retaining important information about pumping, recharge, and aquifer variability that is contained in the groundwater flow model. The measured water levels, simulated groundwater elevations, simulation residuals and calculated model residuals at each of the synoptic monitoring locations are listed in Table 1.</p>
<b>3.0</b>	<p><b>RESULTS</b></p> <p><b><u>Plume and ETR System Monitoring</u></b></p> <p>The semiannual analytical results (December 2008) for FS-12 were compared to the previous analytical results (May 2008) at each of the semiannual monitoring wells. In addition, an overview of ETR system operations during the reporting period was presented by providing extraction well and treatment plant influent EDB concentrations, EDB mass removal, number of carbon changes, extraction well operational flow rates, and a summary of electrical usage by the ETR system. Note that all the analytical data collected in 2008 for the FS-12 SPEIM program were included in the Fuel Spill-12 2008 Summary Letter Report, which was submitted in March 2009 (AFCEE 2009).</p> <p>Data were presented using EDB concentration trend graphs at key monitoring wells. Cross-sections were updated to show both the current and previous EDB concentrations at the semiannual wells. No changes to the plume boundary on the cross sections were needed, based on the semiannual data.</p>



	<b>PROJECT NOTE</b>	TASK ORDER 0148
		PROJECT NO. 389849
<b>AFCEE</b> <b>SPEIM/LTM/O&amp;M</b> <b>Otis ANG Base, Massachusetts</b> <b>Contract FA8903-08-D-8769-0148</b>	<b>DOCUMENT CONTROL NUMBER:</b> <b>389849-SPEIM-FS12-PRJNOT-001</b>  <b>CDRL A0011</b>	PAGE 3 OF 4

ITEM	REMARKS
	<p><b><u>RAM Analysis</u></b></p> <p>As is evident from the mean amended water level residual of 0 feet, and the small standard deviation of 0.028 feet (Table 1), the RAM was very successful at using the water level residuals to adjust the steady-state flow model heads to produce an amended head field that closely agrees with the synoptic data set of measured water levels. These relatively small amended residuals represent very close agreement between the model-predicted and the measured water levels at the monitoring locations.</p> <p>The composite outline of the full extent of the RAM amended 3-D hydraulic capture zone is shown (in plan-view) on Figure 6 of the semiannual data presentation. As can be seen on Figure 6, the FS-12 plume lies within the plan view of the hydraulic capture zone of the FS-12 ETR system that is operating with 2008 Scenario 01 pumping conditions.</p>
<b>4.0</b>	<p><b>ANNUAL DATA PRESENTATION CONCLUSIONS/RECOMMENDATIONS</b></p> <p>The following conclusions and recommendations were presented based on the evaluation of the data collected under the SPEIM program:</p> <ul style="list-style-type: none"> <li>• Changes in influent EDB concentrations at axial extraction wells appear to be related to the optimized pumping configuration, 2008 Scenario 01.</li> <li>• The FS-12 plume within the capture zone of 90EW0031 continues to contract towards that extraction well.</li> <li>• Based on the evaluation of model residuals, it appears that the FS-12 groundwater flow model predicts the groundwater flow field and extent of hydraulic capture in the FS-12 area with reasonable confidence.</li> <li>• The data continue to indicate that the FS-12 is being contained through the operation of the ETR system using pumping configuration 2008 Scenario 01.</li> <li>• The following recommendations were presented in the semiannual data presentation: <ul style="list-style-type: none"> <li>○ Continue to operate the FS-12 ETR system with current pumping conditions (2008 Scenario 01) and monitor the plume with the current SPEIM chemical network.</li> <li>○ Update the EDB plume shell with data collected through the next annual SPEIM sampling event (May 2009).</li> <li>○ Use the updated plume shell with the groundwater model to evaluate alternate pumping strategies (i.e., pulsed pumping).</li> <li>○ Potentially conduct a microcosm test to study EDB biodegradation under both ambient and enhanced conditions.</li> </ul> </li> </ul>

	<b>PROJECT NOTE</b>	TASK ORDER 0148
		PROJECT NO. 389849
<b>AFCEE</b> <b>SPEIM/LTM/O&amp;M</b> <b>Otis ANG Base, Massachusetts</b> <b>Contract FA8903-08-D-8769-0148</b>	<b>DOCUMENT CONTROL NUMBER:</b> <b>389849-SPEIM-FS12-PRJNOT-001</b>  <b>CDRL A001I</b>	PAGE 4 OF 4

ITEM	REMARKS
<b>6.0</b>	<b>REGULATOR COMMENTS/ACTION ITEMS</b>  A follow-up with the regulatory agencies was conducted during the 08 July 2009 Technical Update meeting. No additional comments regarding the results and conclusions presented during the annual data presentation were received or action items identified.
<b>7.0</b>	<b>REFERENCES</b>  AFCEE (Air Force Center for Engineering and the Environment). 2009 (March). <i>Fuel Spill-12 2008 Summary Letter Report</i> . 371335-SPEIM-FS12-SLR-001 Prepared by CH2M HILL for AFCEE/MMR, Installation Restoration Program, Otis Air National Guard Base, MA.  _____. 2008a (January). <i>Final Chemical Spill-10 2007 Southern Trench Technical Memorandum</i> . 337105-SPEIM-CS-10-TECHMEM-003. Prepared by CH2M HILL for AFCEE/MMR, Installation Restoration Program, Otis Air National Guard Base, MA.  _____. 2008b (July). <i>Fuel Spill-12 2008 Extraction, Treatment, and Reinjection System Optimization Project Note</i> . 371335-SPEIM-FS12-PRJNOT-001. Prepared by CH2M HILL for AFCEE/MMR, Installation Restoration Program, Otis Air National Guard Base, MA.  _____. 2005 (July). <i>Final Fuel Spill-12 2005 Optimization Technical Memorandum</i> . 324146-SPEIM-FS12-TECHMEM-002. Prepared by CH2M HILL for AFCEE/MMR, Installation Restoration Program, Otis Air National Guard Base, MA.

Attachments:

Table 1: Residuals Analysis Statistics for the 31 October 2008 Synoptic Water Level Measurement Event

Attachment A: FS-12 2008 Semiannual SPEIM Data Presentation and Capture Zone Analysis, 08 April 2009 Technical Update Meeting

**Table 1**  
**Residuals Analysis Statistics for the 31 October 2008 Synoptic Water Level Measurement Event**  
**FS-12 2008 SPEIM Semiannual Data Presentation Project Note**

Location	Easting (ft)	Northing (ft)	Mid-Screen Elevation (ft msl)	Observed Water Level (ft msl) 31 October 2008	Simulated Water Level October 2008 (ft msl)	Simulation Residual (ft)	Amended Water Level (ft msl)	Estimation Residual (ft)
90JB0001B	869662	250131	35.05	68.50	64.901	-3.599	68.482	-0.018
90JB0001C	869663	250136	-9.83	68.43	64.901	-3.529	68.431	0.001
90JB0001D	869658	250137	-34.93	68.38	64.904	-3.476	68.399	0.019
90JB0004A	870036	250042	1.50	68.26	64.624	-3.636	68.234	-0.026
90JB0004C	870042	250055	33.34	68.24	64.633	-3.607	68.226	-0.014
90MP0059A	867512	252243	-71.24	69.39	65.748	-3.642	69.39	0
90MP0059F	867512	252243	56.26	69.42	65.733	-3.687	69.373	-0.047
90MW0001	868194	253687	23.20	69.90	66.467	-3.433	69.908	0.008
90MW0003	868335	252806	10.40	69.29	66.08	-3.210	69.356	0.066
90MW0006	868420	252285	11.20	69.16	65.814	-3.346	69.197	0.037
90MW0007	868182	253701	-24.30	69.83	66.47	-3.360	69.859	0.029
90MW0009	868157	252314	9.90	69.21	65.818	-3.392	69.225	0.015
90MW0011	867958	251907	30.20	69.05	65.552	-3.498	69.056	0.006
90MW0015	867957	251913	-19.69	69.14	65.558	-3.582	69.118	-0.022
90MW0017	868414	252288	-9.30	69.28	65.814	-3.466	69.266	-0.014
90MW0019	868025	253982	-9.20	70.07	66.573	-3.497	70.065	-0.005
90MW0020	869057	251881	-11.00	69.12	65.588	-3.532	69.109	-0.011
90MW0021	867577	254657	-8.80	70.21	66.804	-3.406	70.233	0.023
90MW0022	867113	254101	-9.40	69.99	66.434	-3.556	69.973	-0.017
90MW0024	869268	251765	-12.77	69.07	65.537	-3.533	69.063	-0.007
90MW0025	868877	251335	-11.00	68.65	65.199	-3.451	68.66	0.01
90MW0026	869111	251306	-10.81	68.90	65.287	-3.613	68.864	-0.036
90MW0027	868480	251376	-29.23	68.73	65.312	-3.418	68.752	0.022
90MW0032	869402	252130	-6.38	69.31	65.722	-3.588	69.289	-0.021
90MW0033	869914	252110	-5.11	69.25	65.66	-3.590	69.232	-0.018
90MW0034	868645	253868	34.95	70.06	66.536	-3.524	70.074	0.014
90MW0036	869121	253790	16.92	69.95	66.469	-3.481	69.962	0.012
90MW0037	869143	254294	44.77	70.32	66.642	-3.678	70.281	-0.039
90MW0038	867752	254294	39.72	70.17	66.675	-3.495	70.167	-0.003
90MW0039	868615	253860	44.63	70.18	66.535	-3.645	70.136	-0.044
90MW0041	868529	254309	31.80	70.21	66.697	-3.513	70.21	0
90MW0042	870394	251163	-1.51	68.97	65.198	-3.772	68.903	-0.067
90MW0047	868811	250486	-49.05	68.99	65.342	-3.648	68.97	-0.02
90MW0052	869768	253503	32.44	69.85	66.272	-3.578	69.836	-0.014
90MW0055	869418	250870	-70.65	68.65	65.14	-3.510	68.65	0
90MW0063	867495	252978	33.60	69.26	66.132	-3.128	69.351	0.091
90MW0065	870709	251100	17.76	68.48	64.941	-3.539	68.483	0.003
90MW0066	869438	250479	-58.64	68.84	65.279	-3.561	68.831	-0.008
90MW0066A	869444	250473	-10.09	68.72	65.264	-3.456	68.746	0.026
90MW0068	869837	250522	-2.10	68.51	65.111	-3.399	68.546	0.036
90MW0070	867727	253039	-9.89	69.76	66.171	-3.589	69.711	-0.049
90MW0071	867890	253039	-14.13	69.53	66.178	-3.352	69.557	0.027
90MW0076	869021	250980	-9.97	68.77	65.296	-3.474	68.783	0.013
90MW0077	870269	250683	-6.11	68.49	65.021	-3.469	68.508	0.018
90MW0078	869196	250678	-8.93	68.96	65.335	-3.625	68.935	-0.025
90MW0079A	869755	250937	2.75	68.76	65.276	-3.484	68.776	0.016
90MW0079B	869759	250932	-37.29	68.88	65.268	-3.612	68.855	-0.025
90MW0079C	869762	250920	-71.30	68.88	65.172	-3.708	68.88	0
90MW0080	867908	252360	-22.41	69.14	65.823	-3.317	69.18	0.04
90MW0081	869429	251267	33.25	68.76	65.355	-3.405	68.79	0.03
90MW0083	869449	250478	22.76	68.80	65.257	-3.543	68.793	-0.007
90MW0084A	869839	250534	-26.74	68.61	65.121	-3.489	68.612	0.002
90MW0084B	869844	250534	28.39	68.59	65.118	-3.472	68.598	0.008

**Table 1**  
**Residuals Analysis Statistics for the 31 October 2008 Synoptic Water Level Measurement Event**  
**FS-12 2008 SPEIM Semiannual Data Presentation Project Note**

Location	Easting (ft)	Northing (ft)	Mid-Screen Elevation (ft msl)	Observed Water Level (ft msl) 31 October 2008	Simulated Water Level October 2008 (ft msl)	Simulation Residual (ft)	Amended Water Level (ft msl)	Estimation Residual (ft)
90MW0085B	868553	250328	21.95	68.97	65.31	-3.660	68.944	-0.026
90MW0086A	870190	251652	-67.79	68.95	65.406	-3.544	68.948	-0.002
90MW0086C	870185	251645	-3.23	68.89	65.422	-3.468	68.905	0.015
90MW0086D	870186	251646	28.42	68.88	65.424	-3.456	68.9	0.02
90MW0087B	870406	250946	31.76	68.61	65.092	-3.518	68.62	0.01
90MW0089E	870345	250400	22.58	68.26	64.726	-3.534	68.258	-0.002
90MW0090C	870192	250153	-37.23	68.12	64.619	-3.501	68.128	0.008
90MW0090D	870192	250153	-12.03	68.13	64.62	-3.510	68.135	0.005
90MW0090E	870190	250146	17.81	68.12	64.618	-3.502	68.131	0.011
90MW0091C	869199	249987	-32.46	68.64	65.004	-3.636	68.619	-0.021
90MW0091D	869198	249986	-7.46	68.57	65.004	-3.566	68.574	0.004
90MW0100A	868357	250913	-76.36	68.92	65.19	-3.730	68.917	-0.003
90MW0100B	868357	250913	-21.27	68.90	65.192	-3.708	68.856	-0.044
90MW0105A	868241	250113	-80.18	68.72	65.112	-3.608	68.719	-0.001
90MW0105B	868241	250113	-45.70	68.72	65.127	-3.593	68.715	-0.005
90MW0106A	868916	251472	-82.35	68.35	65.317	-3.033	68.351	0.001
90MW0106B	868918	251461	-69.03	68.24	64.98	-3.260	68.25	0.01
90MW0106C	868916	251472	-49.67	68.43	64.991	-3.439	68.425	-0.005
90MW0200A	869019	251127	-118.35	68.75	65.252	-3.498	68.75	0
90MW0200B	869018	251127	-85.35	68.74	65.252	-3.488	68.74	0
90MW0200C	869019	251127	-38.31	68.69	65.278	-3.412	68.716	0.026
90MW0201A	868777	251526	-110.22	68.81	65.409	-3.401	68.811	0.001
90MW0201B	868776	251526	-55.22	68.82	65.315	-3.505	68.795	-0.025
90MW0201C	868776	251526	-35.07	68.54	65.322	-3.218	68.626	0.086
ECPZSNP10B	866553	249864	52.99	68.71	64.896	-3.814	68.631	-0.079

**Average = -3.509      0.000**  
**Min. = -3.814      -0.079**  
**Max. = -3.033      0.091**  
**St. Dev = 0.135      0.028**

Key:  
ft = feet  
msl = mean sea level

## **ATTACHMENT A**

# **FS-12 2008 Semiannual SPEIM Data Presentation and Capture Zone Analysis**

**08 April 2009 Technical Update Meeting**

## **Overview**

- Reporting Period: June-08 through Dec-08/Jan-09
- Optimizations: ETR system optimized Jul-08
- Chemical Monitoring (Figures 1 and 2):
  - Post optimization sampling of influent at 90EW0019 (Sep-08)
  - Semiannual sampling event (Dec-08/Jan-09)
    - 20 monitoring wells
    - 6 non-operational extraction wells; and
    - 4 operational extraction wells
  - Monthly sampling of treatment plant influent (Jun-08 through Dec-08)
  - Comparison May-08 results (2006Scenario01) to Dec-08 results (2008Scenario01)

# FS-12 2008 Semiannual SPEIM Data Presentation

## **Overview (cont.)**

- Hydraulic Monitoring:
  - Synoptic groundwater elevation measurements (Oct-08)
  - Capture zone analysis for pumping configuration 2008Scenario01, using Residual Analysis Method (RAM)

# FS-12 2008 Semiannual SPEIM Data Presentation

## Highlights of Chemical Data Review

- Longitudinal Plume Axis (Figure 3)
  - EDB concentrations at axial monitoring wells generally decreased between May-08 and Dec-08 (see Figure 3)
  - EDB concentrations at axial extraction wells:
    - 90EW0014 – BRL (decreased from 0.165 µg/L in May-08)
    - 90EW0015 – 0.247 µg/L (increased from 0.209 µg/L in May-08)
    - 90EW0017 – 0.202 µg/L (increased from 0.136 µg/L in May-08)
    - 90EW0019 – 1.16 µg/L (1.56 µg/L in May-08, 1.01 µg/L in Sep-08)



# FS-12 2008 Semiannual SPEIM Data Presentation

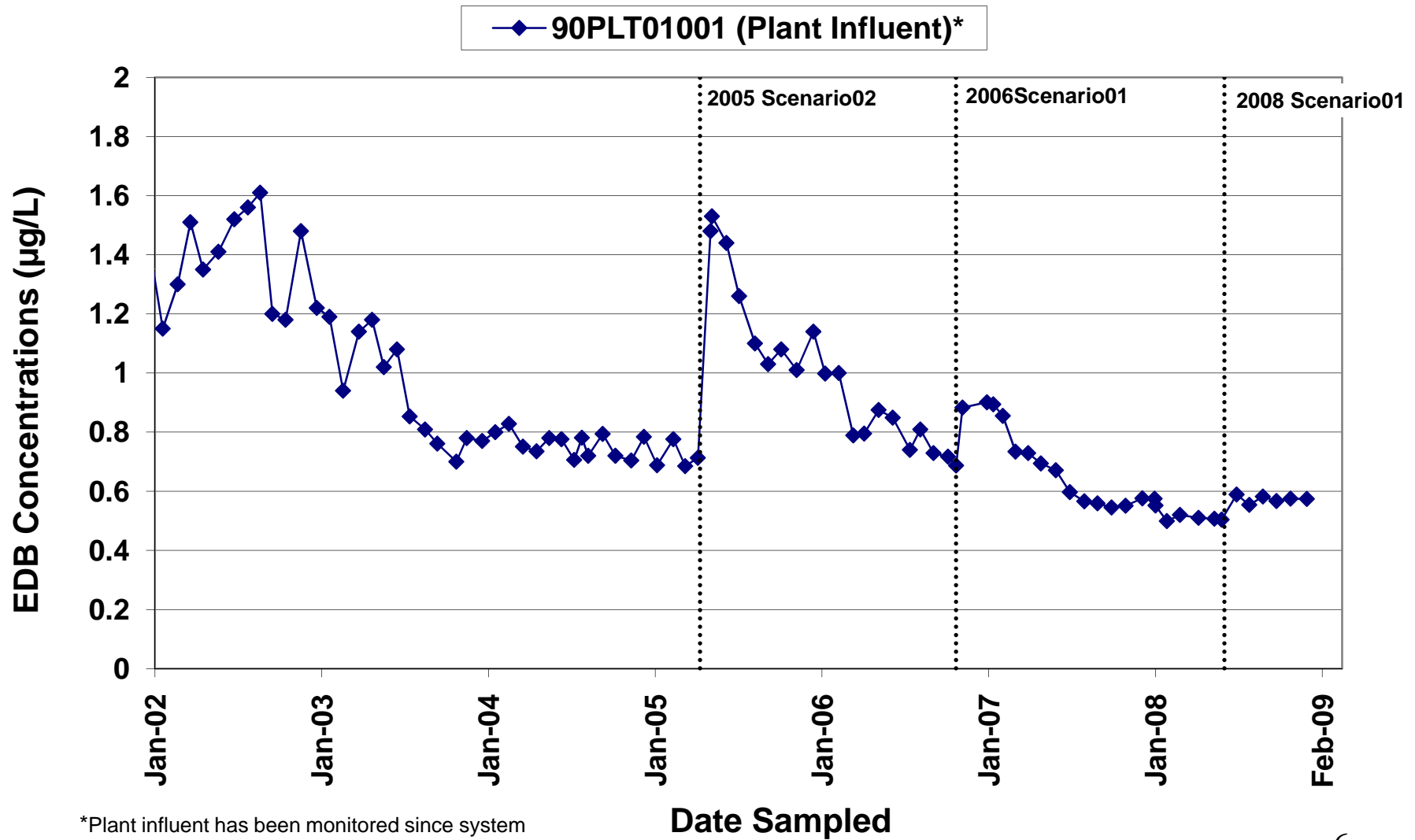
## Highlights of Data Review (cont)

- Toe Fence Extraction Wells (Figure 1)
  - EDB concentrations in:
    - Groundwater at 90EW0024 and 90EW0027 remain ND
    - Influent at 90EW0026 – 0.483 µg/L (decreased from 0.673 µg/L in May-08)
    - Influent at 90EW0025 – 0.547 µg/L (increased from 0.431 µg/L in May-08)
- 90EW0031 Area (Figure 4)
  - EDB concentrations at
    - 90EW0031 influent relatively steady over last 3 semiannual events (0.075 µg/L – 0.061 µg/L – 0.07 µg/L)
    - Nearby monitoring wells continue decreasing trends (see Figure 4)

# FS-12 2008 Semiannual SPEIM Data Presentation

- ETR System Summary
  - Approximately 112 million gallons of groundwater treated by ETR system between June-08 and December-08 (3.9 MG since system startup in 1997).
  - 0.518 lbs of EDB removed between June-08 and Dec-08 (134.1 lbs since system startup)
  - 1 carbon change
  - Most extraction wells operated at 98% design rates
  - Electrical usage between June-08 and Dec-08: 585 MWh
    - Related Emissions
      - 982,963 lbs CO<sub>2</sub>
      - 737 lbs NO<sub>x</sub>
      - 597 lbs SO<sub>2</sub>
      - 35 lbs VOC
      - 23 lbs PM10

# FS-12 2008 Semiannual SPEIM Data Presentation



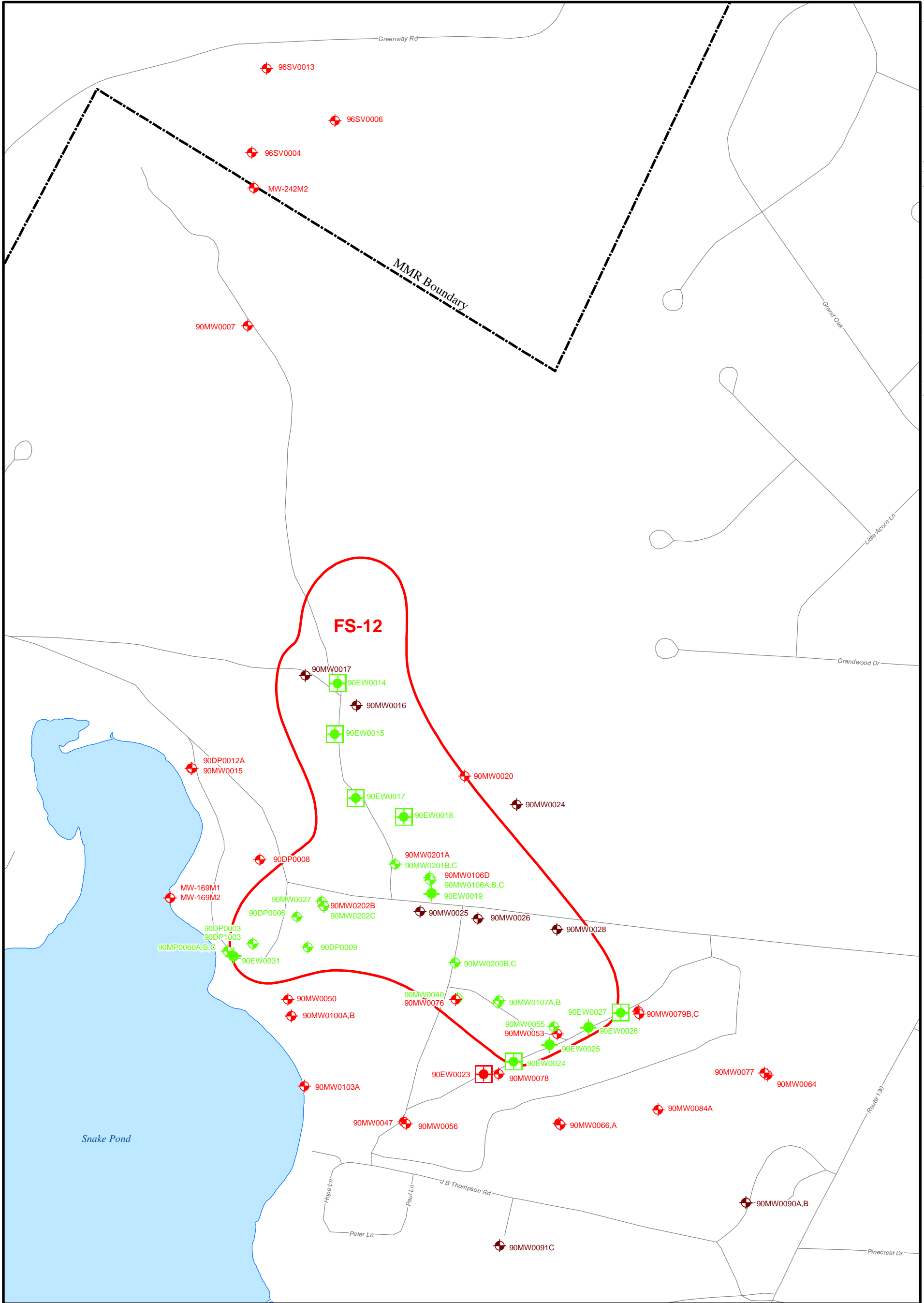
\*Plant influent has been monitored since system startup in 1997, data since 2002 shown to focus on recent data trends.

# FS-12 2008 Semiannual SPEIM Data Presentation

- Hydraulic Monitoring
  - Synoptic groundwater level measurement event completed on 31 October 2008, after implementation of pumping configuration 2008Scenario01 in July 2008 (Figure 5).
  - RAM analysis indicates a good agreement between measured and simulated head fields .
  - The FS-12 plume is located within the composite hydraulic capture zone of the FS-12 ETR system at 2008Scenario01 pumping conditions (Figure 6).

# FS-12 2008 Semiannual SPEIM Data Presentation

- Conclusions
  - Changes in EDB concentrations at axial extraction wells appear to be related to the location of former hydraulic stagnation zones.
  - Plume within capture zone of 90EW0031 continues to contract towards that extraction well.
  - Hydraulic monitoring indicates that the FS-12 plume is contained under current pumping configuration 2008Scenario01.
- Recommendations/Path Forward
  - Continue operating FS-12 using current pumping conditions (2008 Scenario01) and monitor using current SPEIM chemical network.
  - Update the EDB plume shell.
  - Use updated plume shell with the groundwater model to evaluate alternate pumping strategies (i.e., pulsed pumping).
  - Potentially conduct a microcosm test to study EDB biodegradation under both ambient and enhanced conditions.



Data Source: AFCEE, August 2008, MMR-AFCEE Data Warehouse

Legend

- Massachusetts Military Reservation Boundary
- Plume Boundary
- Well Type:
  - Monitoring Well
  - Extraction Well (Operational)
  - Extraction Well (Non-operational)

- Sampling Frequency:
- Annual
  - Semiannual
  - Biennial

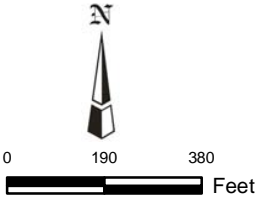
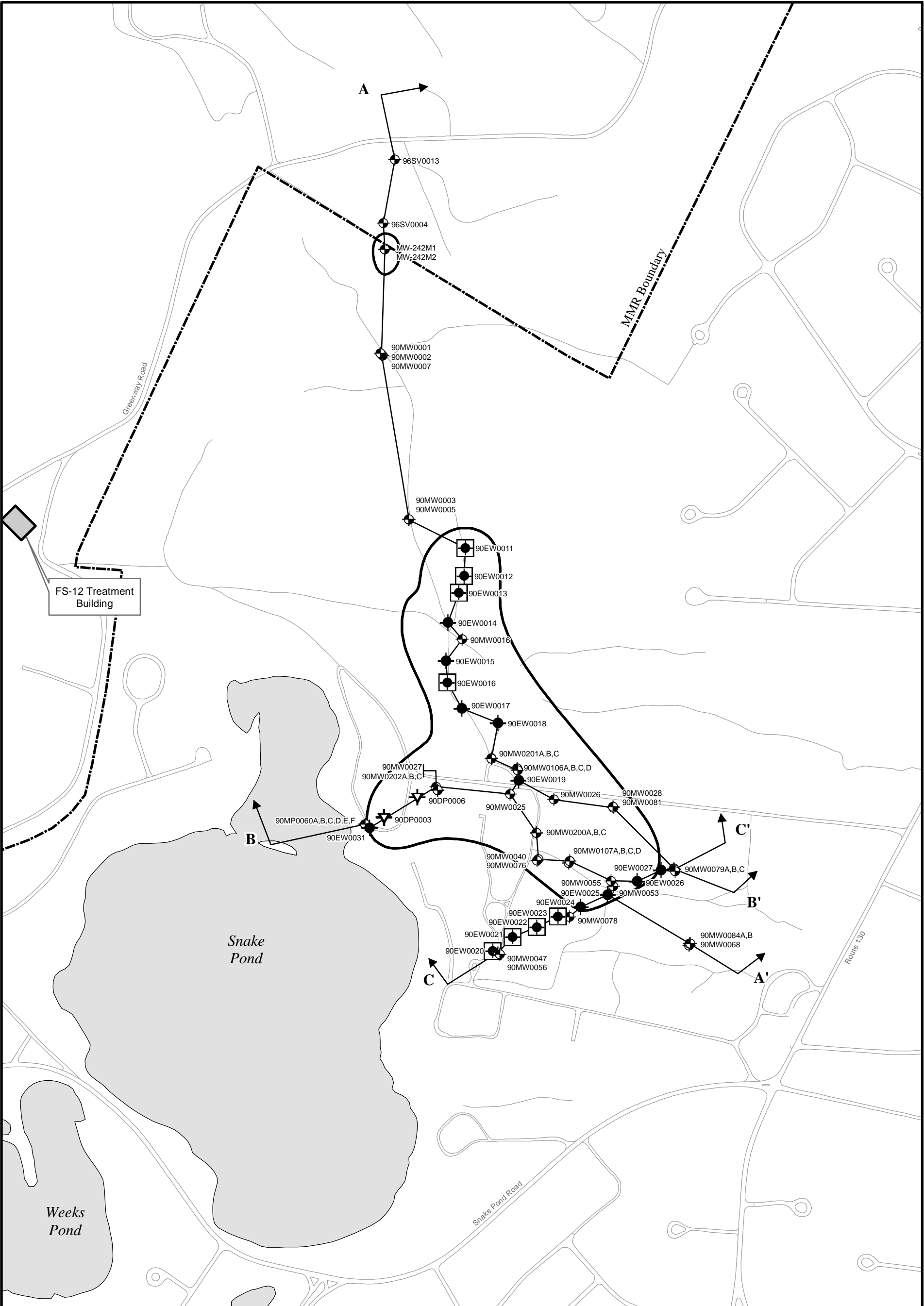


FIGURE 1  
FS-12 CHEMICAL  
MONITORING NETWORK  
AFCEE - Massachusetts Military Reservation  
08 April 2009 Technical Update Meeting



Legend

- Monitoring Well
- Extraction Well
- Extraction Well (Non-Operational)
- Direct Push

- Current Plume Boundary
- MMR Boundary

Data Source: AFCEE, March 2009, MMR-AFCEE Data Warehouse

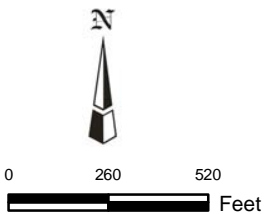
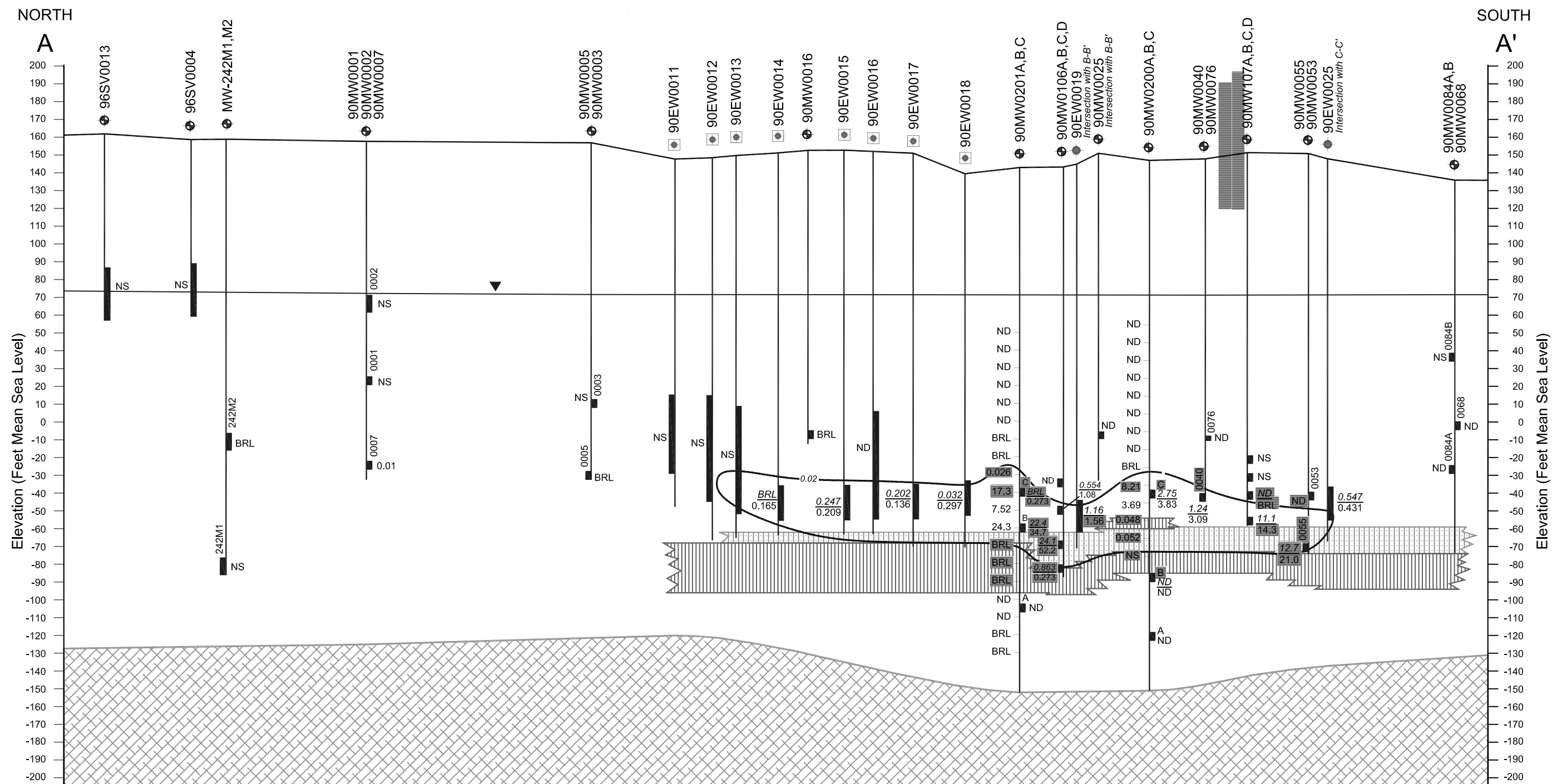






FIGURE 2

CROSS-SECTION LINES  
AT FS-12

AFCEE - Massachusetts Military Reservation  
08 April 2009 Technical Update Meeting



Legend

-  Monitoring Well  
 Extraction Well (On)  
 Extraction Well (Off)  
 Water Table

- |     |                       |
|-----|-----------------------|
| A   | Well Screen ID        |
| BRL | Below Reporting Limit |
| NS  | Not Sampled           |
| ND  | Nondetect             |

- 1.16 EDB Concentration (µg/L) Dec, 2008
- 3.83 EDB Concentration (µg/L) April - May 2008
- 0.03 EDB Screening Data, March 2008 (µg/L)

- 0.02— EDB Plume Boundary  
(MMCL = 0.02 µg/L)

- Silt

Silty Sand

Bedrock

Data Source: AFCEE, March 2009, MMR-AFCEE Data Warehouse.

**FIGURE 3**

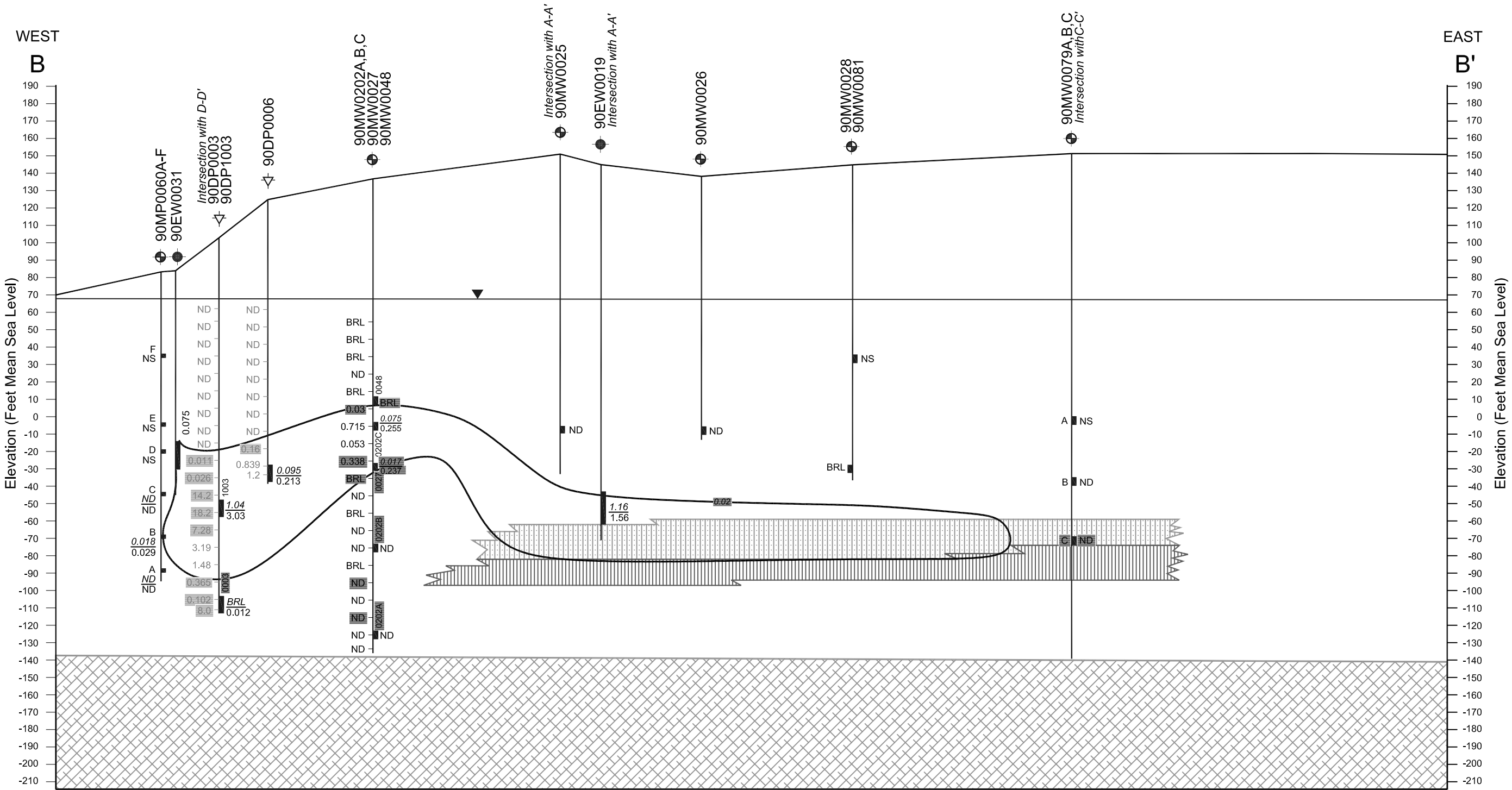
**FS-12 EDB CROSS-SECTION A-A'**

AFCEE - Massachusetts Military Reservation  
08 April 2009 Technical Update Meeting

0 V: 60  
H: 429  
Feet

**-CH2MHILL-**





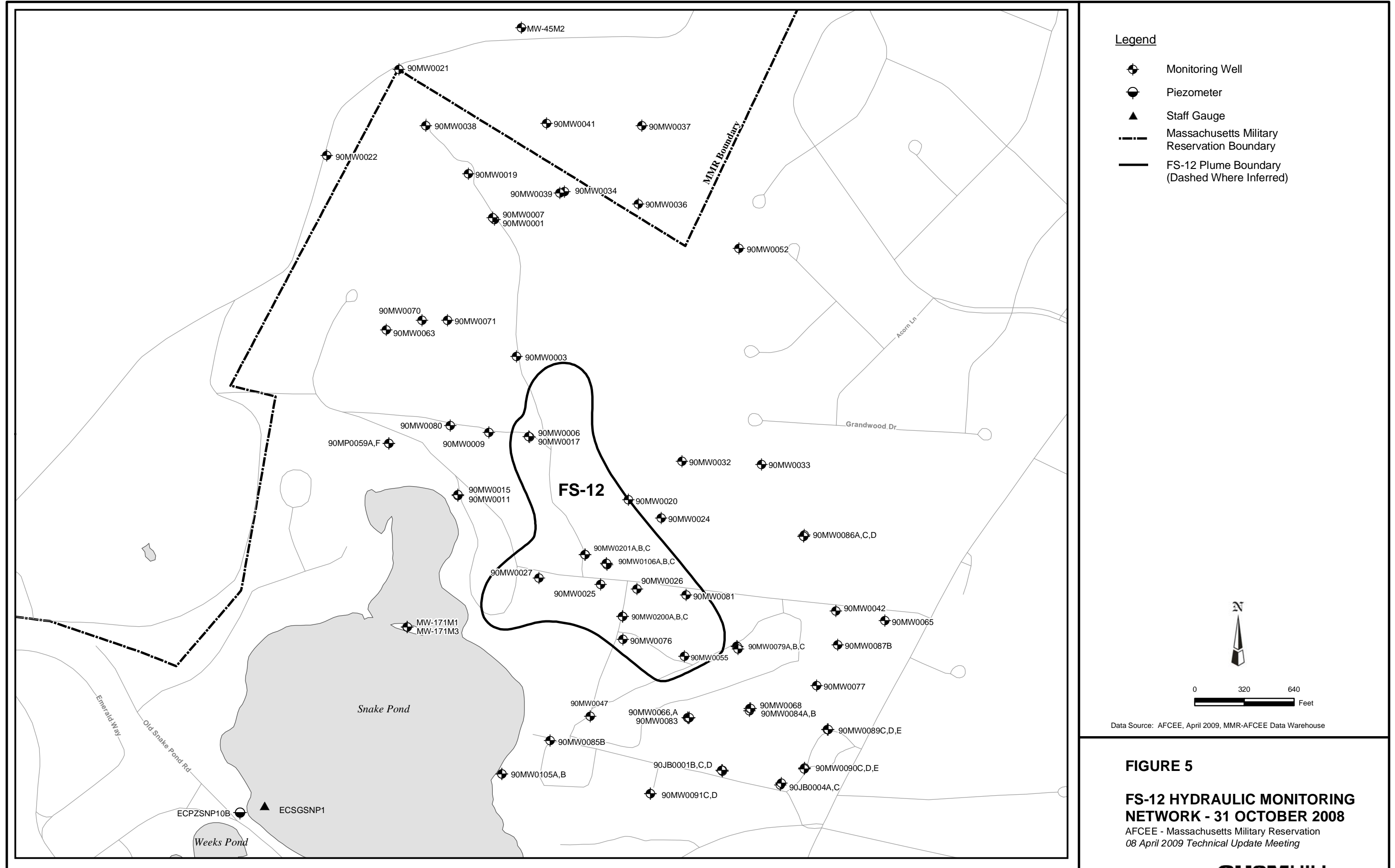
Data Source: AFCEE, March 2009, MMR-AFCEE Data Warehouse.

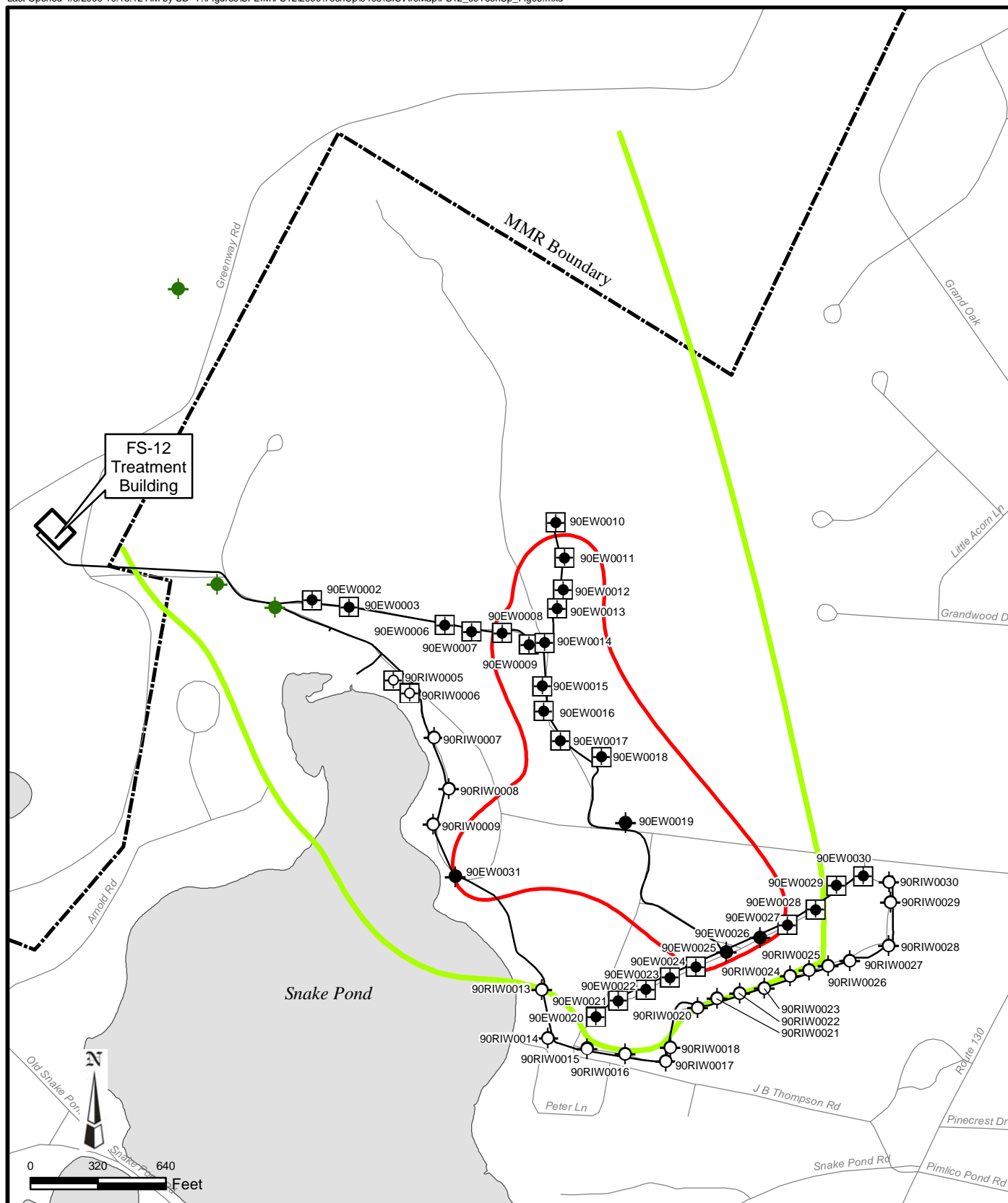
**FIGURE 4**

**FS-12 EDB CROSS SECTION B-B'**

AFCEE - Massachusetts Military Reservation  
08 April 2009 Technical Update Meeting







### Legend

- ◆ Extraction Well (On)
- ◼ Extraction Well (Off)
- ReInjection Well (On)
- ◻ ReInjection Well (Off)
- ◆ J3 Extraction Well (On)

- Model-Predicted Capture Zone Boundary (Based on Amended Head Field 31 October 2008 Hydraulic Data)
- MMR Boundary
- Pipeline
- Plume Boundary

Data Source: AFCEE, April 2009, MMR-AFCEE Data Warehouse

NOTE: Well configuration represents 2008 Scenario 01 Pumping conditions.

### FIGURE 6

### FS-12 EDB PLUME BOUNDARY AND COMPOSITE HYDRAULIC CAPTURE ZONE BOUNDARY BASED ON AMENDED HEAD FIELD

AFCEE - Massachusetts Military Reservation  
08 April 2009 Technical Update Meeting

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